North Pacific Fisheries Commission

NPFC-2025-TWG CMSA11-Final Report

11th Meeting of the Technical Working Group on Chub Mackerel Stock Assessment
REPORT

15-18 July 2025

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15-18 July 2025
Shanghai, China

REPORT

Agenda Item 1. Opening of the Meeting

1. The 11th meeting of the Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA11) took place in a hybrid format, with participants attending in-person in Shanghai, China or online via WebEx, and was attended by Members from Canada, China, the European Union (EU), Japan, the Russian Federation, and the United States of America. An invited expert, Dr. Joel Rice, participated in the meeting.

2. The meeting was opened by the TWG CMSA Chair, Dr. Kazuhiro Oshima (Japan), who welcomed the participants and thanked China for hosting the meeting.

3. On behalf of China, the host Member, Dr. Luo Yi, Vice President of Shanghai Ocean University, welcomed the participants to Shanghai. Dr. Luo thanked the TWG CMSA for its hard work for the management and conservation of chub mackerel, an important species for many Members. He noted that the TWG CMSA has completed its first chub mackerel stock assessment and that NPFC has set catch limits based on this, which represent an important step forward for the science-based management of chub mackerel. Dr. Luo also explained that Shanghai Ocean University is a core institute in China's high seas fisheries research and strives to contribute to the sustainable management of chub mackerel and other species, including through research surveys by the RV Song Hang. Finally, he expressed his hope for a successful meeting with open discussions and strong collaboration for further enhancing the NPFC's chub mackerel stock assessment.

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

5. Mr. Alex Meyer was selected as rapporteur.

Agenda Item 2. Adoption of Agenda

6. The TWG CMSA agreed to add a new agenda item, "9. Future improvement of input data" and a new sub-agenda item, "9.1 Maturity information."

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

Agenda Item 3. Overview of the recommendations and outcomes of previous NPFC meetings relevant to chub mackerel

3.1 TWG CMSA10

8. The Chair provided an overview of the outcomes and recommendations of the 10th TWG CMSA meeting.

3.2 Intersessional meetings of TWG CMSA

9. The Chair provided an overview of the intersessional meetings of the TWG CMSA held on 25–26 April and 30 May.

3.3 SC09

10. The Science Manager presented the outcomes from the 9th Meeting of the Scientific Committee (SC09) of relevance to chub mackerel.

3.4 COM09

11. The Science Manager explained that the Commission adopted a revised Conservation and Management Measure for Chub Mackerel at its 9th meeting. He highlighted the revised catch limits, the requirement to record and report all catches including incidental catches of other NPFC species and discards, and a carry-over provision for the EU's catch limit.

3.4.1 Tasks from COM09 to TWG CMSA

12. The Science Manager explained that the 9th Commission meeting assigned the following tasks to the TWG CMSA:
    (a) Task #1: Provision and analysis of gear specific data to explore whether there is a need to protect the immature portion of the stock and advice on options for achieving that, as appropriate. This includes also accessory devices used for fishing purposes, such as FADs, light devices, etc.
    (b) Task #2: Clarification of the correspondence of fishing days and the level of catch in relevant fleets, such as the purse seine fleet.
    (c) Task #3: Based on the next stock assessment, provide projections and associated probabilities, based on constant catch scenarios (e.g. increments of 5.000 mt) or constant F scenarios, aiming at reaching an appropriate MSY proxy (SSB and F) within 5 to 10 years with a probability higher than 50%.

13. The Data Coordinator, Mr. Sungkuk Kang, provided an update on the Chub Mackerel Monthly/Weekly Catch Reporting System, which was developed last year. The new reporting season for 2025 began on 1 June 2025 and will continue until 31 May 2026. During this period, Members are required to report their catch data by gear type on a monthly basis until the cumulative catch for each gear type reaches 60% of the TAC. Once the catch data for each gear type reaches 60% of the TAC, reporting automatically shifts to a weekly basis. After submission, Members can review their data in the system, disaggregated by gear type. The Secretariat will continue working to enhance the system and welcomes any further feedback from Members.

Agenda Item 4. Members' fishery status and research activities

4.1 Bycatch information

14. The TWG CMSA noted the information provided by Canada on Canadian captures of chub mackerel as bycatch in domestic fisheries and research surveys (NPFC-2025-TWG CMSA11-IP03).

15. The EU informed the TWG CMSA that it has not yet begun fishing for chub mackerel in the NPFC Convention Area.

16. China presented a review of its chub mackerel fishery and research activities (NPFC-2025-TWG CMSA11-IP05). In 2024, China operated 103 purse seine vessels and 3 trawl vessels in the Convention Area. The estimated catch in 2024 of chub mackerel and blue mackerel was about 72,000 MT, an increase from 2023. The distribution of chub mackerel in 2024 was similar to that in 2023. Nominal catch per unit effort (CPUE) decreased from 2019 to 2023 but increased slightly in 2024. The proportion of blue mackerel to the total mackerel catch in 2024 was 0.06. The average length of caught individuals was 249.8 mm, slightly larger than in 2023 (235.5 mm). In 2024, the main individuals at age ranged from 1 to 3, similar to other years. The proportion of mature individuals with gonadal development is relatively high in spring and early summer (April to June) and autumn (October to November). China collects and analyzes fishing logbooks every year, collects samples on fishing vessels and in ports, monitors the monthly ratio of chub mackerel and blue mackerel in catch, and conducts monitoring of biological features.

17. China presented bycatch information from its chub mackerel fisheries (NPFC-2025-TWG CMSA11-IP06). The main bycatch species are Japanese sardine and blue mackerel. Other bycatch species include squid, Pacific saury and other pelagic species.

18. Japan presented a review of the recent fishery and stock status of chub mackerel, including bycatch information (NPFC-2025-TWG CMSA11-IP01). Japan's catch comes from large-

scale purse seine vessels, small-scale purse seine vessels, set nets, and dip nets and other gears. The majority of the catch is from large-scale purse seine vessels but the share of catch from other gears has been increasing in recent years. In the fishing year 2024 (FY2024), preliminary catch as of February 2025 is approximately 38,800 MT. There is usually substantial catch between November and March, with catch in November and December tending to be high, but the peak catch has been decreasing. Japan's 2024 summer surface trawl survey showed distribution of age-0 fish between 150°E and 170°E and a small number of age-1+ fish around 160°E. Nominal CPUE in the survey was generally low. Japan's 2024 autumn surface trawl survey was limited and could not be conducted west of 160°E due to adverse weather conditions, but showed broad distribution of chub mackerel offshore, up to 170°E. The egg survey in 2024 shows that the main spawning ground is centered on the Izu Islands. Egg abundance has been low since 2023, which suggests a low level of reproductive events in 2024. In terms of bycatch, Japan extracted catch records that included mackerel catch from large-scale purse seine vessel logbooks and examined the species composition of these catch records. Only the combined total catch of chub mackerel and blue mackerel was recorded. The most commonly caught bycatch species from these vessels is Japanese sardine. The mean ratio of chub mackerel to blue mackerel for 2014–2024 is 83.4%, but the ratio of chub mackerel has been decreasing in recent years.

19. Russia presented a review of its chub mackerel fishery and research activities in 2024 (NPFC-2025-TWG CMSA11-IP04). Russian vessels fished for mackerel in 2024 throughout the year, starting in January, with the exception of February and March. In 2024, the main fishing grounds were in the Japanese exclusive economic zone (EEZ) in January and partially in December, and the Russian EEZ for the rest of the fishing season. Some vessels also fished in the Convention Area in April, May and December. Average CPUE (catch per vessel per day) was high in the winter months, but significantly lower than in 2020–2022. In the summer and the first half of autumn, the CPUE was very low and did not exceed 5 tons per day, only starting to increase in November. The average CPUE in 2024 was significantly lower than in 2023. Like in 2023, 2024 monthly catches were highest during the winter. Catches were minimal in the summer and increased in the autumn as the number of fishing vessels increased. The 2024 catch was 7,200 MT, which was lower than 2023. In terms of research activities, Russian vessels carry out surveys of the Northwest Pacific Ocean, covering both the Russian EEZ and open waters. Surveys are carried out in June–July annually, and in some years a second survey is carried out in August–September. Surveys are carried out in two ways: pelagic trawls and hydroacoustic surveys. In the survey in the first half of summer 2024, the biomass of mackerel in Pacific waters was estimated as 9,130 MT by trawl survey and 364,000 MT by hydroacoustic survey data. In 2025, the mackerel fishery began on 8 May. In May and June, 5 pelagic trawl vessels engaged in the fishery in the Convention Area near the Russian EEZ. The mackerel catch was the lowest in the last 3 years, and the average CPUE was 3.1

tons per vessel-day. Mackerel in the catches was bycatch from the sardine fishery. As of 31 May, the cumulative mackerel catch in 2025 has been 150.5 MT. As of early June, a trawl survey of the epipelagic zone of the northwestern Pacific Ocean is planned but has not yet begun.

20. The TWG CMSA noted the information provided by Russia on bycatch information from its chub mackerel fisheries (NPFC-2025-TWG CMSA11-IP02), which Russia also presented at an intersessional meeting.

21. The EU noted that in recent years, the species catch composition in the Chinese and Russian fisheries has shifted from mackerel being the dominant species to sardine being the dominant species, and suggested that chub mackerel may now be the bycatch species in these fisheries.

22. China presented biological information on chub mackerel from comprehensive surveys conducted by the RV Song Hang in the northwestern Pacific Ocean from 2021 to 2024 (NPFC-2025-TWG CMSA11-WP11). A total of 3,801 chub mackerel samples were collected and preliminary analyses of the length frequency, growth, and sex ratio of chub mackerel in the high seas were conducted. More studies are in progress, e.g., age determination, growth and mortality estimation considering temporal heterogeneity, and spatial distribution considering environmental influence. This ongoing survey could be a potential data source for estimating chub mackerel life history traits and supporting future stock assessments, offering important insights into the population dynamics of chub mackerel in the Convention Area.

23. China presented an updated standardization of CPUE data for chub mackerel caught by the China’s lighting purse seine fishery from 2014 to 2024 using a generalized additive model (GAM) (NPFC-2025-TWG CMSA11-WP12). Four groups of independent variables were considered in the CPUE standardization: spatial variables (latitude and longitude), temporal variables (year and month), fishery variables (vessel length) and environmental variables (sea surface temperature (SST) and chlorophyll-a concentration (Chla)).

24. The TWG CMSA encouraged Members to present gear-specific fisheries status and bycatch information for all their fisheries that target or catch chub mackerel.

25. The TWG CMSA requested Members to present bycatch information from all vessels that were targeting chub mackerel in recent years, even if their current target species has changed.

Agenda Item 5. Review of results of stock assessment using State-space stock assessment model (SAM)

5.1 Review of data used for stock assessment

26. The TWG CMSA noted that Russia had presented its standardization of CPUE data for chub mackerel caught by its trawl fishery from 2016 to 2024 using GAM (NPFC-2025-TWG CMSA11-WP05) at an intersessional meeting of the TWG CMSA and that the TWG CMSA had agreed to use the Russian standardized CPUE as an input for the chub mackerel stock assessment.

27. Dr. Akihiro Manabe (Japan), one of the TWG CMSA Data Managers, presented the details of the discrepancies between the Annual Summary Footprint and sum of product (SOP) of catch-at-age (CAA) and weight-at-age (WAA) from China, Japan, and Russia and the work done by each Member and the Chair to resolve these discrepancies (NPFC-2025-TWG CMSA11-WP04). China misinterpreted WAA age due to onboard sampling processes and varying sample sizes. This was resolved by refining the data and processing. For Japan, the data aggregation process may have caused discrepancies due to the large number of data sources. There had also been a few minor errors in the calculation process. This was resolved by correcting the calculation. For Russia, calculations were originally conducted only for Russian waters, but catch is also obtained in the Japanese EEZ and the Convention Area. This was resolved by including catches from those areas. These solutions have greatly increased the data quality, and quality control/assurance measures using R and Rmarkdown documentation have also been implemented.

28. The TWG CMSA Data Manager presented a description of the data that the TWG CMSA agreed to use for the base case stock assessment of chub mackerel in the northwestern Pacific Ocean for the 2025 assessment (NPFC-2025-TWG CMSA11-WP03 (Rev.1)). The data consist of CAA, WAA, and maturity-at-age (MAA) since FY1970 with different lengths of temporal data from three Members: China, Japan, and Russia. The paper included the details on each dataset and its derivation, a total of seven standardized abundance indices which are used for stock assessment, natural mortality, and information on the data used for sensitivity scenarios.

29. China noted that age-length key (ALK) information was missing for China and Russia in some years and that the TWG CMSA had decided to apply the ALK for Eastern Japan as a solution. China noted that this created uncertainty in the CAA data for those years and that such uncertainty associated with CAA is not accounted for explicitly in the state-space age-structured (assessment) model (SAM) because CAA is calculated externally and input directly into the model. China suggested that one way to reduce such uncertainty would be to develop a common protocol among Members with a standardized process for deriving ALK.

30. The TWG CMSA Data Manager explained that at a previous meeting, the TWG CMSA had considered a number of potential solutions and had decided to prioritize using an ALK from the same time period as the underlying age composition may vary annually, and that the only such ALKs available for the missing years were the ones for Eastern Japan. He also suggested that as future work, the TWG CMSA could compare the Eastern Japan ALK with the Chinese ALK for years when they were both available and assess the degree of similarity between them.

31. Russia explained that the majority of its catch for the year in question were in fact taken in the Eastern Japan EEZ.

32. Japan explained that, as part of last year's stock assessment, it had conducted sensitivity analyses regarding the uncertainty in the CAA data and considered three scenarios. The analyses found that this uncertainty was not influential.

33. The EU noted that, while ALK information can contribute to uncertainty in CAA data, a more typical and potentially greater source of uncertainty stems from the sampling procedures and estimation methods from which the ALK is derived. The EU therefore suggested that, as a future step, the TWG CMSA should review the sampling designs and associated methodologies employed by Members to better understand and address these sources of uncertainty.

34. China explained that its WAA data were measured based on samples taken in different months and quarters, with the number of samples differing by month and quarter, and that it had therefore decided to submit quarterly WAA data for the stock assessment. China noted that the TWG CMSA Data Manager had converted these quarterly WAA data into yearly data using a simple mean for the stock assessment. China suggested that a simple mean may be misleading due to the different monthly/quarterly sample sizes and offered to submit its own yearly WAA, which it believed would be more representative, going forward.

35. China questioned the biological plausibility of some of the Members' combined quarterly WAA data. Specifically, China noted some instances where the WAA for a younger age class was higher than that of an older age class.

36. The TWG CMSA Data Managers pointed out that the methodology on aggregating WAA from Members is based on the agreement by the TWG CMSA in the previous meetings. The TWG CMSA Data Manager also pointed out that individuals caught by Russia or in the Western Japanese EEZ tend to be heavier than those caught by China or in the Eastern

Japanese EEZ and suggested that the datapoints identified by China could have occurred in quarters where the proportion of the former was higher.

37. The TWG CMSA noted that the same issue was not evident in the yearly WAA data but acknowledged that this issue may need to be examined further.

5.2 Confirmation of setting and specification of SAM

38. The TWG CMSA reviewed and confirmed the setting and specification of SAM which were developed during the previous intersessional meeting. A table of setting and specification of SAM will be attached to the stock assessment report.

5.3 Review of stock assessment results

39. Japan presented a provisional stock assessment for chub mackerel in the Northwest Pacific Ocean in 2024 using SAM (NPFC-2025-TWG CMSA11-WP06). Two candidate base case scenarios were considered. The difference between the two base case scenarios is exclusion or inclusion of the latest (2024) abundance indices. The two scenarios showed almost identical population dynamics. Stock levels were historically high in the 1970s, declined in the 1980s, remained at fairly low levels from the 1990s to the early 2000s, gradually recovered in the late 2000s and increased rapidly after the occurrence of the strong year-class in 2013. However, after peaking in 2017 and 2018 in the scenarios without and with the latest abundance indices, respectively, the stock levels rapidly dropped again. In 2023, the spawning stock biomass (SSB) was only 16% of the respective peak levels. Neither the peak in 2017 (without the latest indices) nor that in 2018 (with the latest indices) reached the stock levels observed in the 1970s. No serious problems were found in the model diagnostics. However, the retrospective analysis showed positive patterns in total biomass and recruitment, and there is room for further improvement on these issues for future. These patterns were smaller when the latest indices were included in the model. While the estimated population dynamics were generally consistent with the base case in the previous stock assessment, the total biomass, SSB, and recruitment in the most recent years were revised downward considerably by the inclusion of the 2023 indices, which were not included in the base case of the previous stock assessment.

40. The EU noted the occurrence of a strong recruitment year-class in 2018 that did not subsequently result in a correspondingly strong annual catch. The EU suggested that the TWG CMSA should investigate the reason for the disappearance of this year-class and discuss how to handle the uncertainty of future strong recruitment events that may not be reflected in the catch at expected levels.

41. Japan suggested that if such a strong recruitment year-class were to occur again in the future, it could include a pessimistic scenario, similar to what occurred to the 2018 year-class, as part

of the future projections.

42. Japan presented a study investigating the increased retrospective pattern in the 2025 provisional chub mackerel stock assessment in the Northwest Pacific Ocean (NPFC-2025-TWG CMSA11-WP08). Retrospective patterns quantified by Mohn's rho for stock biomass and recruitment over the five-year retrospective analysis increased compared to the values in the previous year's assessment. The primary factor was found to be that all index values for 2023 were lower than the predicted values of the model without 2023 indices, leading to a downward revision of recent stock biomass and recruitment when including the 2023 indices. The one-year shift in the reference period used to calculate Mohn's rho also contributed to the increase in the values. In contrast, changes in the stock assessment model settings had little effect. It was also found that revisions to catch-at-age data prior to 2022 contributed to a reduction of Mohn's rho. The presence of retrospective patterns does not necessarily mean estimation bias; but sometimes the addition of new data to stock assessments results in revised estimates of key parameters which can be perceived as retrospective patterns. Japan recommended that the latest available abundance indices be included in the chub mackerel stock assessment to mitigate future shifts in abundance estimates that would inevitably occur if the latest data were excluded.

43. Japan presented sensitivity analyses that were conducted to examine the impacts of observation uncertainty and model uncertainty in the 2025 stock assessment of chub mackerel in the Northwest Pacific Ocean (NPFC-2025-TWG CMSA11-WP07). The analyses showed that the assumptions of biological parameters that are necessary to use the 2024 fishing year abundance indices do not greatly affect stock abundance estimates. They also showed that models with the 2024 indices had higher prediction skill than models without the 2024 indices. Japan suggested using the most recent abundance indices in the stock assessment, considering the robustness and predictability. The analyses also suggested that process errors for age-1 and older fish and nonlinearity for age-0 and age-1 indices substantially change stock dynamics such as the strength of the 2013 year-class, but these models exhibited bad model performance with respect to fit, prediction skill, and robustness. Maximum sustainable yield (MSY) reference points were highly sensitive to the choices of data, biological parameters, and stock-recruitment relationship. This highlights the difficulty of using the MSY reference points, and it may be appropriate to use more robust quantities based on historical SSB estimates as interim and empirical reference points, such as median or quartiles.

5.4 Discussion on base cases and representative cases

44. The TWG CMSA agreed to use the scenario proposed by Japan that included the latest (2024) abundance indices as the base case.

45. The EU emphasized the need to explore the feasibility of changing the timing of the TWG CMSA's meetings and stock assessments so that the most recent year's catch data can also be included in future stock assessments.

Agenda Item 6. Future projections and biological reference points

6.1 Confirmation of projection methods and scenarios

46. The TWG CMSA reviewed the projection methods and scenarios as part of its review of the projection results under agenda item 6.2 below.

6.2 Review of projection results

47. Japan presented biological reference points and future projections in the 2025 stock assessment for chub mackerel in the Northwest Pacific Ocean (NPFC-2025-TWG CMSA11-WP09). The estimated SSB_{MSY} was highly sensitive to input data and model configurations, and estimated values were consistently higher than the current stock abundance. Japan proposed using the first to third quartiles of historical SSB as interim reference points, which might be used for short- or long-term target and limit, and future probabilities calculated over these empirical reference points as well as the MSY-based ones. Stochastic future projections showed that, under constant-catch scenarios, unless the annual total catch is kept below 60,000–70,000 tons, there is less than a 90% probability of maintaining SSB above the first quartile, and less than 60% probability of reaching the median five years later (in the 2031 fishing year). Under constant-F scenarios, fishing pressure must be F50%SPR (about 70,000 tons catch in the 2026 fishing year) or lower to achieve the median SSB with a probability exceeding 50% after five years. Considering the projection results that indicate the stock continuing to decline under the current fishing pressure (16-17% SPR) as long as the body weight and maturity rate remain at the current low level, it is necessary to substantially reduce fishing pressure in order to avoid further decline and facilitate stock recovery. Japan also argued that the development of harvest control rule and target and limit reference points is urgently needed for the long-term sustainable management of this stock.

48. China considered the third quartile (75^{th} percentile) of estimated historical SSB to be unrealistically high for an interim target reference point (TRP) as, by definition, this is a level of SSB that the stock did not reach in 75% of the years in the historical period, and the productivity of the stock has declined in recent years.

49. Japan pointed out that historical fishing mortality in the past was much higher than the current expected level and believed that the third quartile could realistically be attained.

50. The EU noted that SSB reached the third quartile of historical levels in some recent years and that the third quartile was lower than all SSB_{MSY} estimations presented by Japan. The EU

questioned whether a TRP lower than the third quartile would be sufficiently precautionary.

51. The TWG CMSA discussed alternative levels of estimated historical SSB as candidate interim TRPs, in particular 50th percentile (median), which corresponds approximately to 20% of SSB_0 in recent years (2016–2023), and 70th percentile, which corresponds approximately to 40% of SSB_0 in recent years (2016–2023).

52. The EU and Japan expressed concern about proposing the 50th percentile of the estimated historical SSB as a candidate TRP given the underlying uncertainty in the model.

53. The TWG CMSA agreed to use the following two reference levels to evaluate future harvest scenarios for the discussion of the Commission. Those reference levels may be considered as candidate interim TRPs but caution is warranted given, on one hand, the uncertainty inherited in the chub mackerel stock assessment model and their relatively low level against theoretical SSB_{MSY}, while on the other, unfavorable biological conditions in recent years, which may make it difficult for the stock to recover to those levels in a timely manner.
   (a) 50th percentile of the estimated historical SSB (1970–2023)
   (b) 70th percentile of the estimated historical SSB (1970–2023)

54. The TWG CMSA recommended that the SC recommend 25th percentile of estimated historical SSB as a limit reference point to the Commission.

55. The TWG CMSA also explored the development of an MSY proxy based on recent unfished spawning biomass per recruit (SPR_0), based on a suggestion by the invited expert. The TWG CMSA encouraged the invited expert to continue to develop this work.

56. The TWG CMSA noted that the stock has experienced large changes in biological parameters, particularly a decrease in MAA, which are highly influential on the abundance of the stock. The TWG CMSA encouraged Members to work collaboratively to further refine their estimation of MAA.

6.3 Discussion on contents to be shown in the stock assessment report in response to the tasks from COM09

57. The TWG CMSA addressed task#3 from COM09. Results can be seen in the Executive Summary and the stock assessment report.

Agenda Item 7. Stock assessment report

7.1 Review of draft executive summary

58. The TWG CMSA drafted the executive summary of the chub mackerel stock assessment

report (Annex D).

7.1.1 Stock status

59. See the executive summary of the chub mackerel stock assessment report (Annex D).

7.1.2 Management advice

60. See the executive summary of the chub mackerel stock assessment report (Annex D).

7.1.3 Others

61. No other matters were discussed.

7.2 Review of draft stock assessment report

7.3 Work assignments to finalize the report towards SC10 meeting

62. The TWG CMSA agreed to work intersessionally to finalize the stock assessment report and submit it to the SC10 meeting. See Annex E for a detailed timeline.

Agenda Item 8. Response to the tasks from COM09

8.1 Task #1

63. As a first step for responding to task #1 from the Commission, the TWG CMSA agreed to calculate and compare the relative exploitation rates of immature and mature chub mackerel and to present the results to SC10.

64. The TWG CMSA noted that the estimates of fishing mortality for immature fish are lower than those for mature fish according to the stock assessment results. However, the TWG CMSA also noted that the estimates for older age classes may be subject to various uncertainties based on the assumptions in the model. As future work, the TWG CMSA agreed to evaluate the potential uncertainty in the stock assessment model's estimates of fishing mortality at older ages to enable a more accurate comparison of relative fishing mortality between younger and older fish.

65. The EU noted that the exploitation rates of immature and mature fish, while might provide some insight, can't be used as a stand-alone metric to determine if specific gears disproportionally catch immature fish. That is because SAM is estimating F-at-age and selectivity for all gears combined, considering the input data are aggregated over all Members and fleets. Therefore, any gear specific selectivity is masked. In addition, although the estimates indicate relatively lower F for immature fish ($F_{0\text{-}3}$), the F estimates at older ages ($F_{4\text{-}6+}$) are uncertain due to model assumptions and potentially the plus group absorbing unexplained variability in the observed data, such as discrepancies in catch-at-age or survey indices. This makes direct comparisons between age groups difficult. The EU suggests that

gear specific data are provided to be able to effectively respond to the COMs task #1.

66. The TWG CMSA noted that the proportion of mature fish per age appears to have changed, particularly in the case of age-2 and 3 fish, which used to contribute substantial spawning potential to the population but no longer do so. As future work, the TWG CMSA agreed to conduct further studies to investigate if this is in fact occurring, including the possibility that there may have been a physiological change in spawning behavior that is not being captured by the current egg survey.

8.2 Task #2

67. As a first step for responding to task #2 from the Commission, the TWG CMSA agreed to prepare a description of how each Member defines and calculates "fishing day" and to present this information to SC10, and, in the longer-term, to work towards a common methodology for defining and calculating "fishing day."

68. The TWG CMSA agreed to prepare a paper with its responses to the tasks from the Commission and to submit it to SC10.

Agenda Item 9. Future improvement of input data

9.1 Maturity information

69. Japan presented a review of its gonad index (KG) based maturity criterion for female chub mackerel of the Pacific stock (NPFC-2025-TWG CMSA11-WP10). Japan has been using KG as a maturity criterion, with KG=3 as a sign of maturity. It reviewed this criterion by estimating maturity probability curves based on KG and gonadosomatic index (GSI) using chub mackerel collected in 2013–2023, determining the maturity probability at KG=3, and comparing the annual changes in the threshold values for maturity based on KG and GSI. Japan found that KG=3 is a good indicator to extract only matured fish. However, this strict criterion labeled many individuals in early stages of yolk accumulation as immature. The 50% maturity KG showed a lower trend during 2019–2022 than during 2014–2018, whereas the 50% maturity GSI exhibited a relatively stable trend. Hence, Japan considered GSI to be a more appropriate maturity criterion. The 50% maturity GSI ranged from 1.6–1.8 in 2014–2023 and was 1.6 in the 2013–2023 integrated version. Japan suggested that using 50% maturity, notably GSI of 1.6, as the maturity criterion would be more appropriate and improve MAA data for future stock assessments, while noting that KG=3 nevertheless accurately designates maturation.

70. China asked Japan whether MAA submitted by Japan is based on KG=3. Japan answered that Japanese MAA is estimated by observation of catch composition in the spawning ground, but also using KG=3 as reference.

71. China presented an analysis of its identification method for gonadal maturity and MAA calculation methods for chub mackerel (NPFC-2025-TWG CMSA11-WP13). China determined the maturity based on visual inspection, tried the method proposed by Japan, and conducted a comparison. China concluded that the maturity of chub mackerel in the Convention Area should generally be lower than that of individuals in the Japanese EEZ.

72. Japan suggested that China aggregate its data across years, sort them on a monthly basis, and try to identify any monthly patterns in the GSI distribution.

73. Japan suggested to exchange information such as seasonal and regional trends in GSI and the proportion of mature individuals to support collaborative work on better understanding chub mackerel maturity.

74. The TWG CMSA agreed to hold an intersessional workshop among interested Members to work collaboratively to standardize the maturity criterion for chub mackerel.

75. Subject to the workshop agreeing on a standardized maturity criterion for chub mackerel, the TWG CMSA requested Members to use this criterion when determining maturity and preparing their MAA data for the data preparatory meeting (TWG CMSA12).

76. The TWG CMSA noted that in the longer-term, it would also be useful to work on the following:
    (a) investigate the different reproductive biology observed in the Convention Area and the Japanese EEZ.
    (b) standardize the method used for estimating maturity ogives.
    (c) standardize the aging method.

Agenda Item 10. Data collection and management

10.1 Data provision templates

77. Ms. Karolina Molla Gazi (EU), the Lead of the Small Working Group on Data (SWG Data), provided an update on the development of the data provision templates. She explained that SWG Data is still working intersessionally to update the templates but they would not be significantly changed. She also explained that the new template for chub mackerel data would include lists for maturity scale and the corresponding maturity stage and encouraged Members to share information on which scale and corresponding stage they use.

10.2 Update on GitHub repository and user manual

78. The Data Coordinator provided an update on the GitHub repository and user manual. He

explained that the SC has previously expressed its preference for the NPFC to obtain a GitHub Team Plan account as a non-profit organization, which offers higher data storage and transmission bandwidth, and that the NPFC has received approval for such an account on 10 July 2025. Currently, 8 Members, invited experts, and the Secretariat are registered as users within the GitHub Team plan. The Repository is structured around the TWG CMSA, the Small Scientific Committee on Bottom Fish and Marine Ecosystems (SSC BF-ME), and the Small Scientific Committee on Neon Flying Squid (SSC NFS). The user manual is available on the NPFC website (https://www.npfc.int/git-repository-user-manual). This manual can be continuously enhanced based on Members' feedback.

10.3 Observer Program

79. The Science Manager reminded the TWG CMSA 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 TWG CMSA, provided responses. The Science Manager explained that these responses were provided to the TCC but the Commission considered them to be insufficient and recommended that the SC and the TCC continue to work on this matter. Based on this, the TCC Chair has posed additional questions to the SC and its subsidiary bodies concerning critical data points, current level of confidence in NPFC stock assessments, monitoring of rare events, data for development of management procedures and accounting for potential effects of climate change, and electronic monitoring systems. The Small Working Group on Observer Program will establish a process for answering these questions intersessionally, draft responses, and circulate the responses to the relevant SC subsidiary bodies for review.

Agenda Item 11. Review of the Work Plan for the TWG CMSA

11.1 Climate change related issues

80. No papers were submitted under this agenda item.

11.2 Options to minimize the time lag between the terminal year of the stock assessment and the management decisions

81. The TWG CMSA discussed changing the timing of its data preparatory and stock assessment meetings with the aim of minimizing the time lag between the terminal year of the stock assessment and the management decisions. The TWG CMSA recognized the value of changing the timing but noted that there were practical difficulties that needed further discussion. The TWG CMSA agreed to discuss this matter further in the intersessional period. A timetable was suggested to complete the stock assessment with data up to the most recent fishing year by the December SC meeting, and the TWG CMSA agreed to hold discussions

before the next SC meeting about whether this would be possible.

11.3 Work Plan of the TWG CMSA

82. The TWG CMSA reviewed and updated the Work Plan of the TWG CMSA (NPFC-2025-TWG CMSA11-WP01).

11.4 NPFC Performance Review recommendations

83. The Science Manager explained that the Commission has developed a new process for reviewing progress against the Performance Review recommendations as described in NPFC Circular 038-2025. In accordance with this process, the SC Chair has reviewed the progress on the implementation of recommendations that concern the SC and its subsidiary bodies and submitted her responses to the Commission. Therefore, the TWG CMSA does not need to conduct its own review this year. The SC-related recommendations will be further reviewed during the SC10 meeting in December 2025.

Agenda Item 12. Other matters

12.1 Timeline and intersessional activities before TWG CMSA12

84. The TWG CMSA drafted a timeline of tasks leading up to TWG CMSA12 (Annex E).

85. The TWG CMSA agreed to tentatively schedule the 12th TWG CMSA meeting for 24–27 February 2026, subject to intersessional discussion by the TWG CMSA and direction from SC10. A draft agenda for TWG CMSA12 will be circulated after SC10 determines a meeting schedule for the TWG CMSA.

12.2 Species summary

86. The TWG CMSA reviewed and updated the species summary for chub mackerel (NPFC-2025-TWG CMSA11-WP02 (Rev. 1)). The TWG CMSA recommended that the SC adopt the updated species summary (Annex F).

12.3 Invited expert

87. The TWG CMSA recommended that the SC continue to hire an invited expert in 2026.

12.4 Other issues

88. No other matters were discussed.

Agenda Item 13. Recommendations to the Scientific Committee

89. The TWG CMSA agreed to:
   (a) hold an informal intersessional workshop among interested Members to work

collaboratively to standardize the maturity criterion for chub mackerel.

(b) discuss intersessionally changing the timing of TWG CMSA data preparatory and stock assessment meetings with the aim of minimizing the time lag between the terminal year of the stock assessment and the management decisions.

(c) tentatively schedule the next TWG CMSA meeting for 24-27 February 2026, subject to intersessional discussion by the TWG CMSA and direction from SC10.

(d) continue to work intersessionally in accordance with the agreed timeline (Annex E).

90. The TWG CMSA recommended that the SC:

(a) endorse the stock assessment executive summary (Annex D) and stock assessment report (to be submitted to SC intersessionally).

(b) recommend the following reference levels to the Commission:

i. 50th percentile of the estimated historical SSB (1970–2023)

ii. 70th percentile of the estimated historical SSB (1970–2023)

(c) recommend the 25th percentile of estimated historical SSB as a limit reference point to the Commission.

(d) adopt the Work Plan of the TWG CMSA (NPFC-2025-TWG CMSA11-WP01).

(e) adopt the updated species summary for chub mackerel (Annex F).

(f) continue to hire an invited expert to support the TWG CMSA in 2026.

(g) consider changing the meeting schedule for the TWG CMSA, subject to intersessional discussion by the TWG CMSA.

Agenda Item 14. Adoption of Meeting Report

91. The report was adopted by consensus.

Agenda Item 15. Close of the Meeting

92. The Chair thanked the participants for their cooperation and constructive discussions.

93. The meeting closed at 15:45 on 18 July 2025, Shanghai time.

LIST OF ANNEXES

Annex A – Agenda
Annex B – List of Documents
Annex C – List of Participants
Annex D – Executive summary of the stock assessment of chub mackerel
Annex E – Timeline and intersessional activities before the TWG CMSA12 meeting
Annex F – Species summary for chub mackerel

Annex A:

Agenda

Agenda Item 1. Opening of the Meeting

Agenda Item 2. Adoption of Agenda

Agenda Item 3. Overview of the recommendations and outcomes of previous NPFC meetings relevant to chub mackerel

- 3.1 TWG CMSA10
- 3.2 Intersessional meetings of TWG CMSA
- 3.3 SC09
- 3.4 COM09
    - 3.4.1 Tasks from COM09 to TWG CMSA

Agenda Item 4. Members' fishery status and research activities

- 4.1 Bycatch information

Agenda Item 5. Review of results of stock assessment using State-space stock assessment model (SAM)

- 5.1 Review of data used for stock assessment
- 5.2 Confirmation of setting and specification of SAM
- 5.3 Review of stock assessment results
- 5.4 Discussion on base cases and representative cases

Agenda Item 6. Future projections and biological reference points

- 6.1 Confirmation of projection methods and scenarios
- 6.2 Review of projection results
- 6.3 Discussion on contents to be shown in the stock assessment report in response to the tasks from COM09

Agenda Item 7. Stock assessment report

- 7.1 Review of draft executive summary
    - 7.1.1 Stock status
    - 7.1.2 Management advice
    - 7.1.3 Others
- 7.2 Review of draft stock assessment report
- 7.3 Work assignments to finalize the report towards SC10 meeting

Agenda Item 8. Response to the tasks from COM09

8.1 Task #1

8.2 Task #2

Agenda Item 9. Future improvement of input data

9.1 Maturity criterion

Agenda Item 10. Data collection and management

10.1 Data provision templates

10.2 Update on GitHub repository and user manual

10.3 Observer Program

Agenda Item 11. Review of the Work Plan for the TWG CMSA

11.1 Climate change related issues

11.2 Options to minimize the time lag between the terminal year of the stock assessment and the management decisions

11.3 Work Plan of the TWG CMSA

11.4 NPFC Performance Review recommendations

Agenda Item 12. Other matters

12.1 Timeline and intersessional activities before TWG CMSA12

12.2 Species summary

12.3 Invited expert

12.4 Other issues

Agenda Item 13. Recommendations to the Scientific Committee

Agenda Item 14. Adoption of Meeting Report

Agenda Item 15. Close of the Meeting

Annex B:

List of Documents

MEETING INFORMATION PAPERS

Symbol	Title
NPFC-2025-SSC NFS02-MIP01 (Rev. 3)	Meeting Information
NPFC-2025-TWG CMSA11-MIP02	Provisional Agenda
NPFC-2025-TWG CMSA11-MIP03 (Rev. 2)	Annotated Indicative Schedule

WORKING PAPERS

Symbol	Title
NPFC-2025-TWG CMSA11-WP01	TWG CMSA Work Plan, 2025-2029
NPFC-2025-TWG CMSA11-WP02 (Rev. 1)	Chub mackerel species summary
NPFC-2025-TWG_CMSA11-WP03 (Rev.1)	The data description for the base case stock assessment of chub mackerel *Scomber japonicus* in the northwestern Pacific Ocean for 2025 assessment
NPFC-2025-TWG CMSA11-WP04	Details and resolution on the discrepancy of annual footprint and sum of product of catch at age and weight at age from China, Japan, and Russia
NPFC-2025-TWG CMSA11-WP05	Standardized CPUE of Russian commercial trawl fishery of chub mackerel in the Northwest Pacific up to 2024
NPFC-2025-TWG CMSA11-WP06	Candidate Base Case Scenarios for the 2025 Chub Mackerel Stock Assessment in the Northwest Pacific Ocean
NPFC-2025-TWG CMSA11-WP07	Sensitivity analyses of the 2025 chub mackerel stock assessment in the Northwest Pacific Ocean
NPFC-2025-TWG CMSA11-WP08	What caused the increase in retrospective pattern in the chub mackerel stock assessment in the Northwest Pacific?
NPFC-2025-TWG CMSA11-WP09	Biological reference points and future projections in the 2025 stock assessment for the Northwestern Pacific chub mackerel
NPFC-2025-TWG CMSA11-WP10	Review of the maturity criterion using gonad index in Pacific stock chub mackerel
NPFC-2025-TWG CMSA11-WP11	Chub mackerel biology information from Song Hang survey in the Northwest Pacific from 2021 to 2024
NPFC-2025-TWG CMSA11-WP12	Standardized CPUE of Chub mackerel (*Scomber japonicus*) caught by the China's lighting purse

	seine fishery up to 2024
NPFC-2025-TWG CMSA11-WP13	Analysis of identification method for gonadal maturity and MAA calculation methods on Chub mackerel in China

INFORMATION PAPERS

Symbol	Title
NPFC-2025-TWG CMSA11-IP01	Recent fishery and stock status of chub mackerel from Japan
NPFC-2025-TWG CMSA11-IP02	Russian by-catch data from Chub mackerel fisheries in the Northwest Pacific
NPFC-2025-TWG CMSA11-IP03	Chub Mackerel Catch in Canada updated for 2024
NPFC-2025-TWG CMSA11-IP04	Chub mackerel Russian fishery in the northwest Pacific Ocean Pacific Ocean, research activities in 2024-2025
NPFC-2025-TWG CMSA11-IP05	Review of chub mackerel fishery in China and research activities in 2024-2025
NPFC-2025-TWG CMSA11-IP06	Data description on fisheries bycatch in the chub mackerel fisheries in China

REFERENCE DOCUMENTS

Symbol	Title
NPFC-2025-TWG CMSA11-RP01	Summary of the 1st Intersessional Meeting of the Technical Working Group on Chub Mackerel Stock Assessment
NPFC-2025-TWG CMSA11-RP02	Summary of the 2nd Intersessional Meeting of the Technical Working Group on Chub Mackerel Stock Assessment
NPFC-2025-TWG CMSA10-Final Report	10th TWG CMSA Meeting Report
NPFC-2025-COM09-Final Report	COM09 Meeting Report

Annex C:
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Annex D:

Executive summary of the stock assessment of chub mackerel

Background information

Chub mackerel (*Scomber japonicus*) in the Northwest Pacific Ocean (NWPO) are distributed from the coast of southern Japan to offshore waters of Kuril Islands. It is considered that both adults and juveniles are distributed as far east as the 170-degree East longitude line. The feeding migration of adults has expanded to the northeast recently, and since 2018 the distribution of adults during summer and fall has reached 47-degree North, 166-degree East, east offshore of Kuril Island. The spawning ground is known to be located within the range of the Japanese Exclusive Economic Zone (EEZ), with the main spawning ground located in Izu Island waters.

Chub mackerel are harvested by China, Japan and Russia (Figure 1). Chinese light purse seine and pelagic trawl fisheries operate in the NPFC Convention Area, while Japanese chub mackerel fisheries consist mainly of purse seine and set net fisheries within the Japanese national waters. Russian chub mackerel fisheries mainly operate in the Russian national waters and consist of mid-water trawl and purse seine gears. Russian fisheries also operate bottom trawl gears in the Japanese national waters. The historical total landings have fluctuated largely and recently decreased from approximately 516,000 mt in 2018 to 128,586 mt in the most recent calendar year (CY) 2024. The Conservation and Management Measure for chub mackerel (CMM 2025-07) includes a catch limit of 66,740 mt set in the Convention Area for the 2025 fishing seasons.

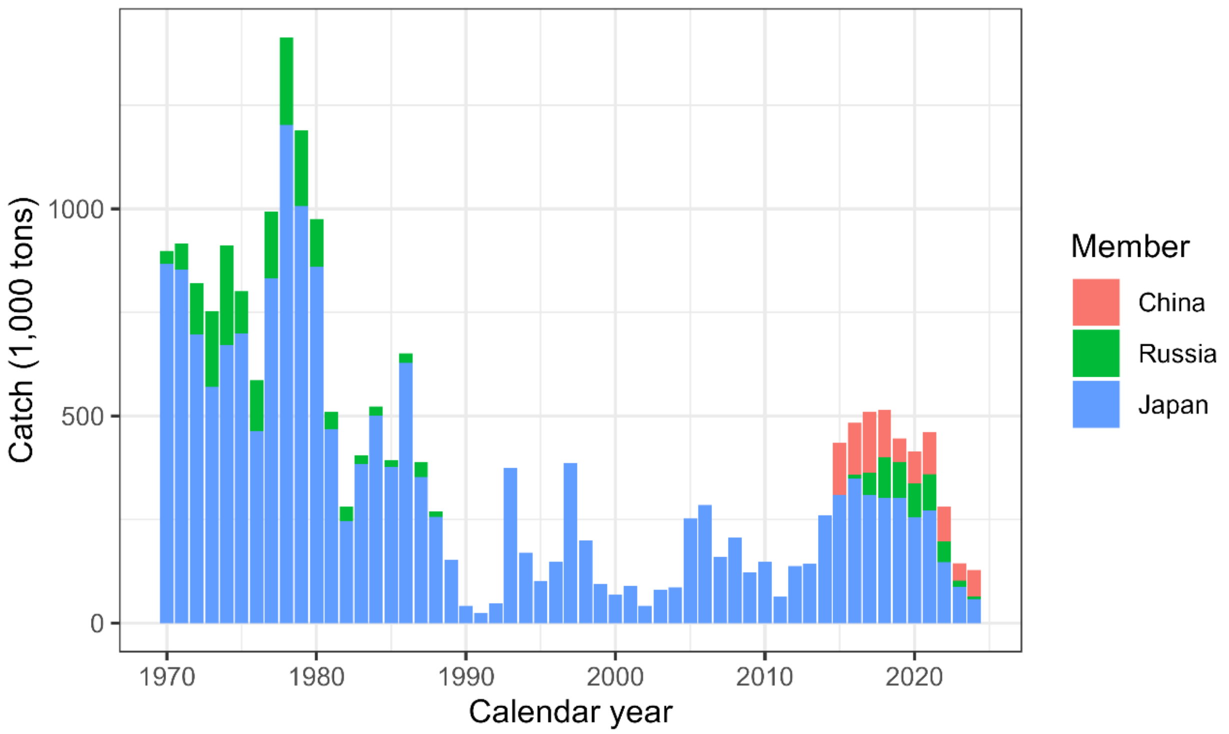

Figure 1. Historical chub mackerel catch in weight by Member. The provisional Chinese catch for 2024 is estimated using the historical ratio for chub mackerel and blue mackerel.

Stock assessment model

A state-space stock assessment model (SAM) was agreed to be used for the chub mackerel stock assessment by the Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA). SAM accounts for observation errors in catch-at-age data and abundance indices. It uses age-specific data on catch numbers, stock weight, and maturity rate in each year. Recruitment was defined as numbers at age 0, and spawning stock biomass (SSB) was calculated through multiplication of numbers-at-age by maturity-at-age and weight-at-age. SAM consists of two subparts: a population dynamics model and an observation model.

Age-structured population dynamics for chub mackerel estimated by SAM are driven through survival processes such as natural and fishing mortalities, as well as process errors. Reproduction is calculated by a Beverton-Holt stock recruitment relationship. Fishing mortality coefficients by year and age group are assumed to follow a multivariate random walk, consequently allowing estimation of time-varying selectivity.

In the observation model of SAM, the catch-at-age is estimated though the fitting of the Baranov equation to the observed catch-at-age under a lognormal error distribution. SAM also fits to abundance indices with a lognormal error assumption. Non-linear relationships to population abundance estimates were estimated for the three abundance indices specific to ages 0 and 1, linear relationships were applied to the other abundance indices.

Data and biological parameters used in the assessment model

Data are included from the NPFC Convention Area and Members' EEZs.

A fishing year (FY) starting from July and ending in June of the following year was applied in the stock assessment of chub mackerel. The TWG CMSA agreed for the stock assessment period to be FY1970 to FY2023. Seven age groups of ages 0 to 5 and 6+ were defined in the stock assessment. The historical catch-at-age, which was constructed from the quarterly data from each Member, is shown in Figure 2. Time series of mean weight-at-age are illustrated in Figure 3. Annual maturity-at-age with decadal time-varying changes is shown in Figure 4. These data were available up to FY2023.

Seven time series of the relative indices of abundance were used during model development (Figure 5): relative number of age 0 fish from the summer survey by Japan; relative number of age 0 fish from the autumn survey by Japan; relative number of age 1 fish from the autumn survey by Japan; relative SSB from the egg survey by Japan; relative SSB from the dip-net fishery by Japan; relative vulnerable stock biomass from the light purse-seine fishery by China; and relative vulnerable stock biomass from the trawl fishery by Russia. The indices from Japan and Russia were available until FY2024 and until FY2023 for China.

An age-specific natural mortality (M), corresponding to 0.80 for age 0, 0.60 for age 1, 0.51 for age 2, 0.46 for age 3,0.43 for age 4, 0.41 for age 5, and 0.40 for age 6+, was applied for the stock assessment by the TWG CMSA.

Overall, the available data show 1) recent decreases in the relative abundance trends, 2) a shift to older average age at maturity, 3) changes in weight at age, and 4) declining catch trends.

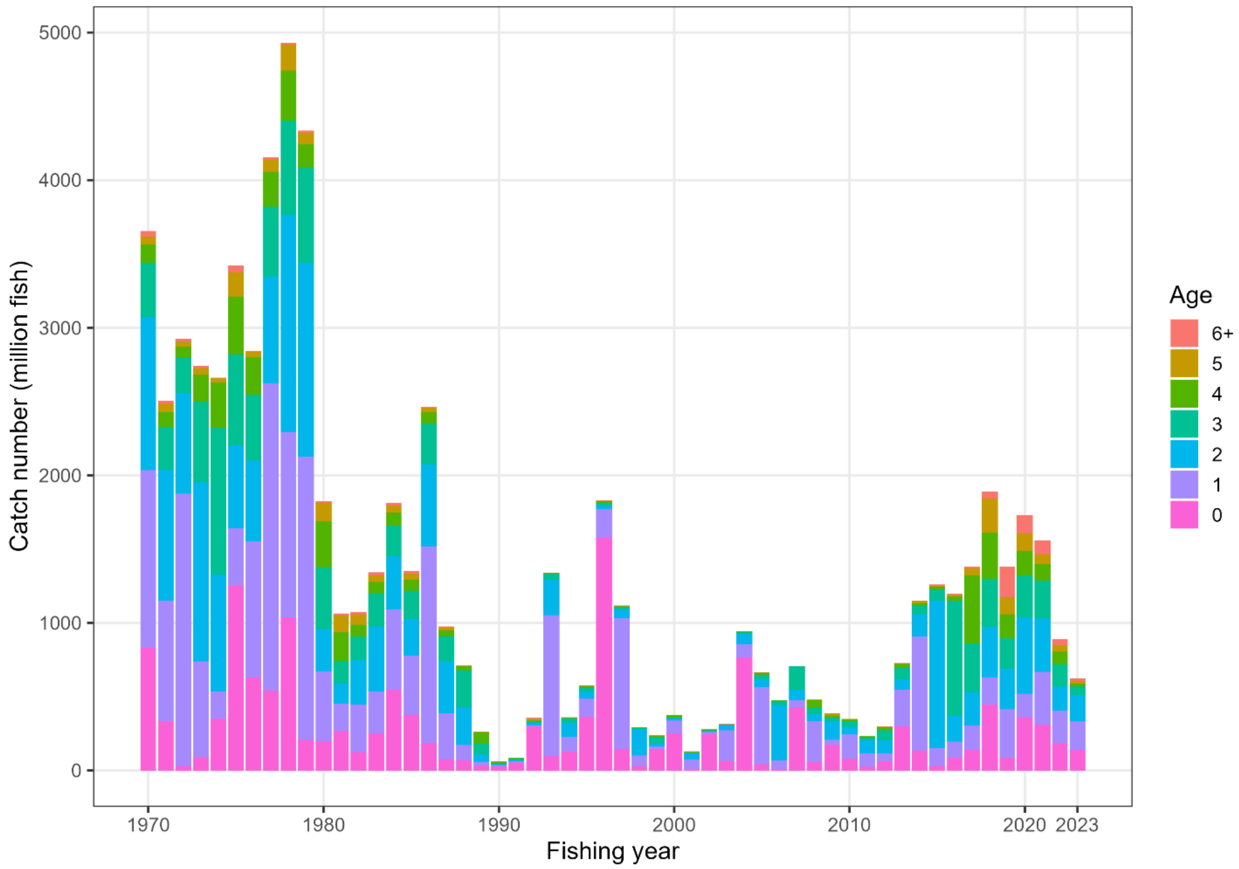

Figure 2. Historical observed catch-at-age.

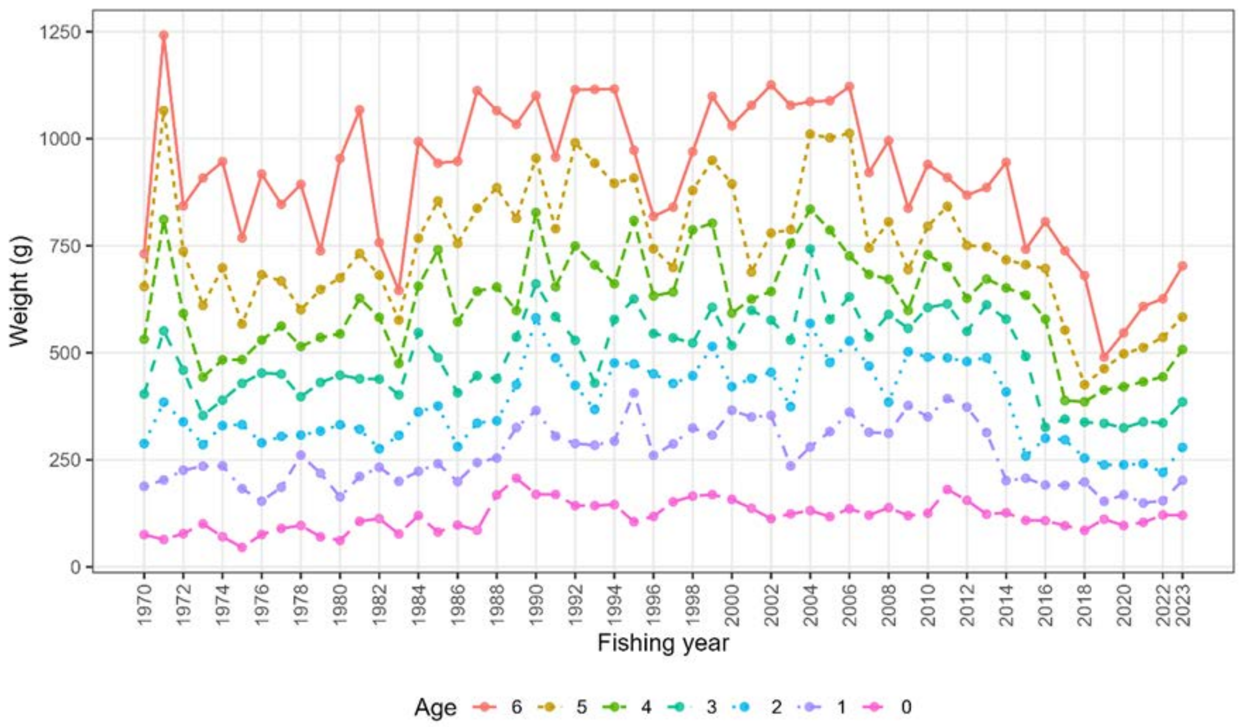

Figure 3. Time series of weight-at-age.

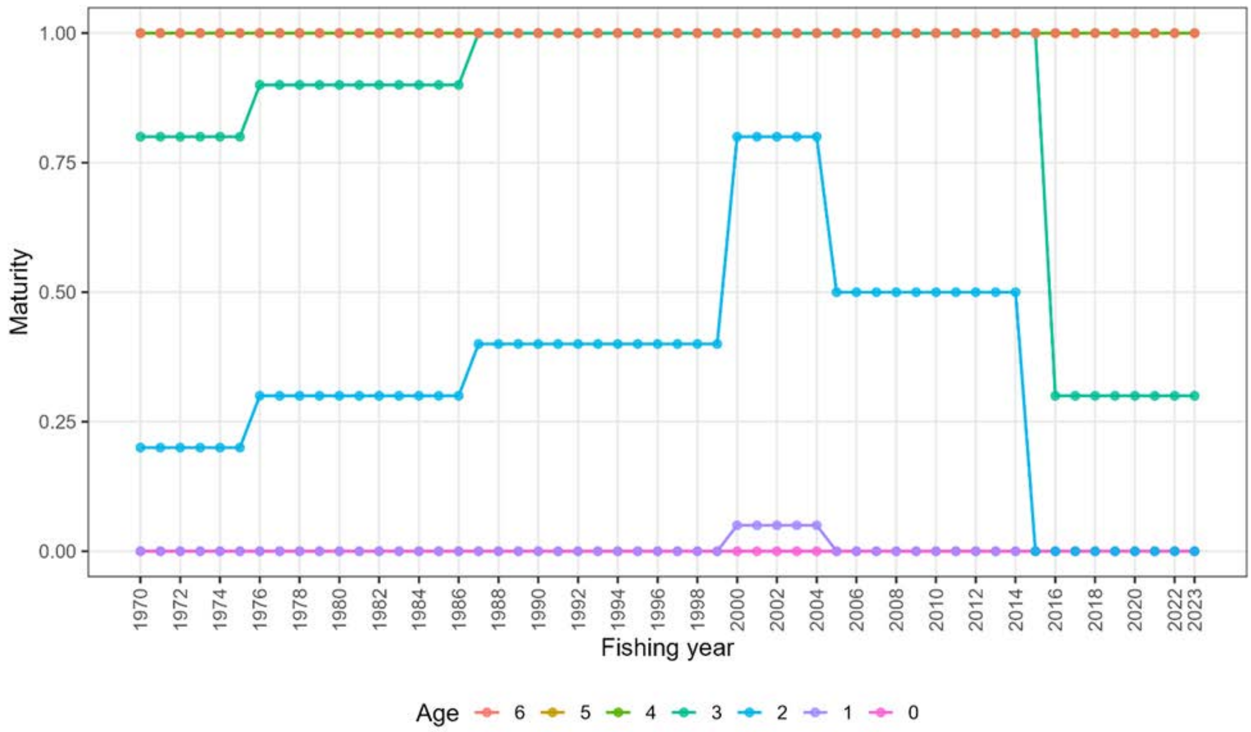

Figure 4. Time series of maturity-at-age.

Figure 5. Time series of abundance indices, note that the y- scales differ.

Main stock assessment scenarios

The TWG CMSA based this year's stock assessment on the previous assessment and included the following scenarios as candidate base cases:

- **S01-InitBase.** This scenario is based on the TWG CMSA 09 base case (S28-Proc Est), which excluded the latest abundance indices. Therefore, the abundance indices up to FY2023 were used as input in this scenario (FY2024 indices were excluded).

- **S02-Index24_1.** This scenario included the FY2024 abundance indices from Japanese and Russian fisheries and Japanese surveys. The weight and maturity at age for FY2024 were assumed to be their averages throughout FY2016–FY2023. The proportion of Russian catch out of the total catch was assumed to be its average over FY2021–FY2023. Although the catch in FY2024 is not available, stock status in FY2024 is able to be calculated because stock status is determined before exploitation.

Seventeen other sensitivities were used to investigate the effect of alternative assumptions regarding the biological parameters in FY2024, Russian catch proportion in FY2024, nonlinearity for abundance indices, stock-recruit relationship, maturity processes and assumptions regarding process error in numbers at age. TWG CMSA agreed to select S02-Index24_1 as a base case scenario because of its robustness and better diagnostic performance.

F-based reference points

The TWG CMSA calculated these reference points along with commonly used biological reference points such as F%SPR (30%, 40%, 50%, 60% and 70%), F0.1, with mean biological parameters and selectivity of the current fishing mortality (F_{cur}, average in FY2021 to FY2023) (Table 1). In particular, the biological parameters such as weight-at-age and maturity-at-age used for calculation of biological reference points are assumed as the average values during the most recent 8 years (FY2016 to FY2023), which represents the recent shift in biological parameters. As a comparable, the average of the biological parameters over the stock assessment period is used for the calculation of these reference points.

B-based reference points

While the F-based reference points are relatively robust to the time-varying biological parameters, commonly used B-based reference points such as SSB_{MSY} and SSB0 are found to be significantly affected by the changes of biological parameters in this stock as well as by the assumptions of stock recruitment relationships and model configurations. Owing to the uncertainty, the TWG CMSA explored some empirical reference points based on percentiles of historical SSB in FY1970–FY2023 (Figure 6). The 25th percentile of SSB could be regarded as the limit, being above the SSB levels when the stock has been severely depleted during the 1990's and early 2000's. The remaining two reference points ($SSB_{REFERENCE\_A}$ and $SSB_{REFERENCE\_B}$) are the 50th and 70th percentiles of historical estimated SSB.

Although these levels of SSB are significantly lower than the theoretically calculated SSB_{MSY} under the assumption of Beverton-Holt type SR relationship without considering the time-varying nature of biological parameters, the two SSB reference points are about 20% of $SSB_{F=0\_RECENT}$ and about 40% of $SSB_{F=0\_RECENT}$, respectively, which is calculated as the multiplier between average lifetime contribution to the spawning stock biomass per fish assuming no fishing (SPR0) and average number of recruitment during the most recent 8 years. The quantity roughly approximates the level of SSB that could have been attained on average over the last decade if there had been no fishing.

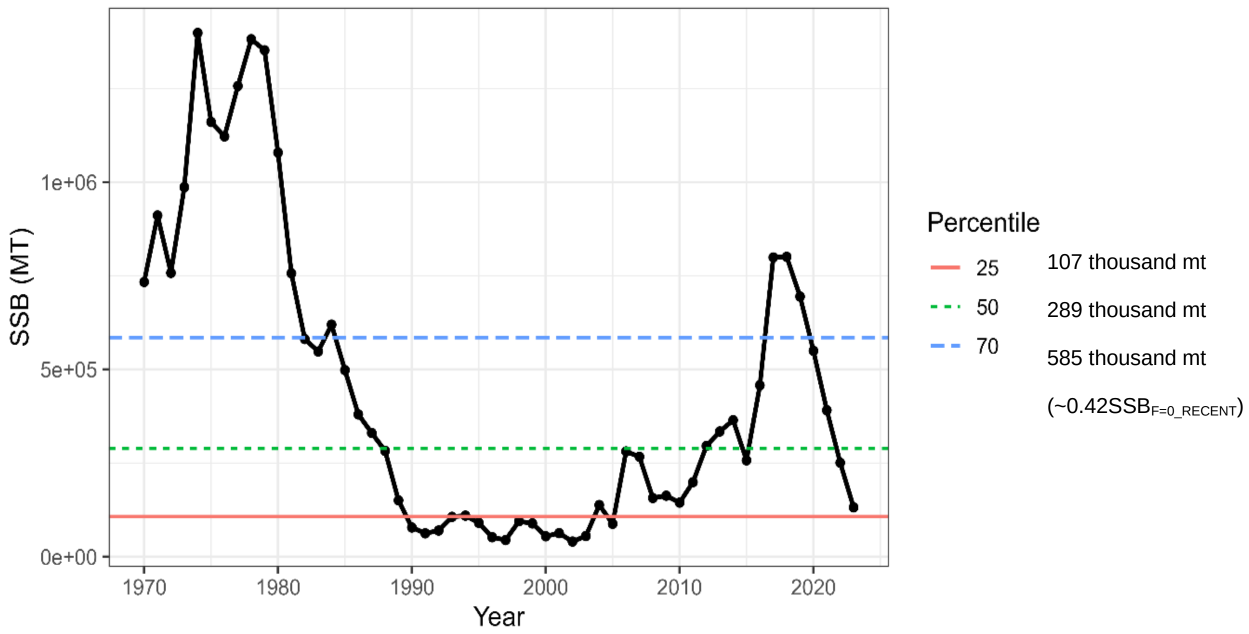

Figure 6. Estimated spawning stock biomass and its 25th, 50th and 70th percentiles.

Description of specification of future projections

The population dynamics model for stochastic future projections is the same as is used in SAM. Future projections were conducted assuming a constant catch a fixed amount (ranging from 0 to 200 thousand mt in increments of 10 thousand mt) each year from FY2026 to FY2036. Constant F projections were also conducted under F_{cur} and Constant-F scenarios where the catch was calculated by a fixed fishing mortality (ranging from F30%SPR to F70%SPR in increments of 5%SPR) each year since FY2026. For all scenarios the catch in FY2024 and FY2025 is based on the assumption that the fishing mortality in FY2024 and FY2025 would be the same as the FY2023 fishing mortality estimated by SAM.

Two assumptions regarding biological parameters were used for the calculation of reference points, one where the future biological parameters are assumed to equal the average of the recent eight (FY 2016−FY2023) years, and another where the mean biological parameters for the entire model time period (FY1970–FY2023) are used to calculate the reference points. The TWG CMSA recommends the use of the recent average based on the assumption that the prevailing conditions will likely persist for the near future.

Stock status overview

Total biomass, Spawning Stock Biomass

The time series of estimated chub mackerel total biomass and SSB generally declined from the 1970s through the 1990s (Figure 8). The stock began to recover in the early 2000s, peaking in FY2018, then SSB has declined to 16% of that peak in 2023. The spawning stock biomass in 2023 is slightly higher than SSB_{LIM} (SSB_{2023}/SSB_{LIM}=1.23) but lower than $SSB_{REFERENCE\_A}$ and $SSB_{REFERENCE\_B}$ (Table 1).

Recruitment

The level of recruitment in the 1970s was estimated to be high (~15 billion individuals on average) and reached a low period between the 1990s and the 2010s (Figure 8). Recruitment in the most recent decade (FY2014–FY2023) was also high on average (~7.4 billion), but not as high as in the 1970s and had a decreasing trend since the last peak in 2018. The estimated Beverton-Holt stock recruitment relationship was slightly concave (Figure 9), suggesting that the density-dependent effect in recruitment is not strong.

Exploitation status
Estimated exploitation rate generally fluctuated between 10% and 35%, with over 40% and below 10% in several years, following the estimated F dynamics. No clear temporal trend was observed (Figure 7). The current fishing mortality (F_{cur}) corresponds to 16% SPR, and higher than the commonly used F-based reference points such as F0.1 and F30–70%SPR (Table 1). Fishing mortality related reference points indicate that the stock is at approximately 16% SPR, indicating that current fishing mortality are also reported for percent FSPR values, in relation to the current F (Fcur, average FY2021–FY2023) for FSPR from the recent period (FY2016–FY2023) as well as over the entire time period (FY1970–FY2023; Table 1).

Conclusions and recommendations
The chub mackerel stock in the NWPO has experienced large changes in biological parameters over the time period of the model. The main temporal changes are a recent decrease in maturity at age, along with a recent change in the weight at age, both of which were observed to impact the model time period to cause temporal impacts on biological reference points. MSY-based reference points are highly variable over the time series of the assessment because the weight- and maturity- at age of chub mackerel have varied widely (Figures 3 and 4), which impacts the productivity of the stock. Unfished spawning biomass per recruit (SPR0) has varied remarkably over time (Figure 7).

Besides such uncertainty, the current fishing mortality (average FY2021–FY2023) is higher than the commonly used reference points such as F%30–60%, and SSB in FY2024 is lower than the reference levels of median and 70th percentiles ($SSB_{REFERENCE\_A}$ & $SSB_{REFERENCE\_B}$, respectively), but slightly above the SSB_{LIM}.

Harvest Recommendations
Given the uncertainty in biological parameters in future, which has a large impact on the projection results, the TWG CMSA considers it is not appropriate to provide long-term harvesting recommendations at this time. However, in response to the request from COM09, 10 year projection was undertaken to assess the effects of varying catch and F levels based on the most recent eight years' biological data (Figures 10 and 11, Tables 2 to 5). Projections indicate that current fishing mortality is unsustainable, and probabilities of achieving various reference levels under catch-constant as well as F-constant scenarios are provided in Tables 2 and 3. It is recommended to reduce fishing mortality to recover SSB to the reference levels.

Data and Research needs
The assessment results, including projections, are dependent on biological parameters and processes which are uncertain. Therefore, future studies should be focused on collecting and analyzing biological information, e.g., maturity-at-age and weight-at-age, which would improve the assessment. Fisheries-dependent data, such as fleet-specific catch-at-age, are also critical to develop Member-specific fishing fleet and age-specific abundance indices. It is also important to explore the factors that contributed to the lower-than-expected presence of the 2018 year class in catch-at-age data, despite strong signals in survey indices.

A critically important recommendation that should be carried out in 2-3 years is to develop a harvest control rule (HCR) specific to this stock via a Management Strategy Evaluation (MSE) process. This HCR should be dynamic and able to adjust annual total catches depending on the stock abundance as well as the target and limit reference points. During the process of the development of MSE, uncertainties in parameter estimates, time-varying or density-dependent biological parameters, stock-recruitment assumptions, process errors, and selectivity should be considered.

Timely collection of biological information and further research on biological parameters and processes, including the effect of environment and climate change, are critically important to facilitate the accurate estimation of reference points.

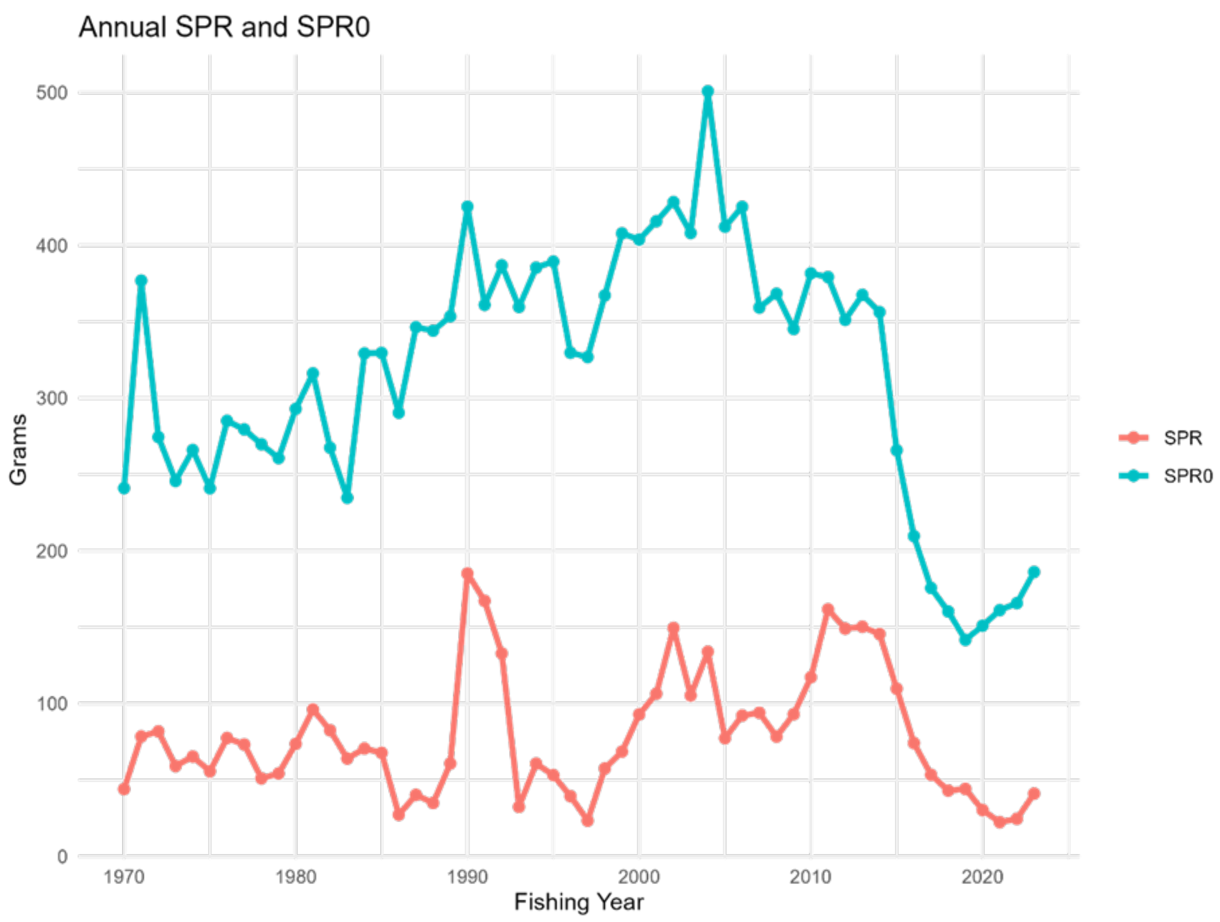

Figure 7. Trajectories of spawners per recruit with (SPR) and without fishing (SPR0).

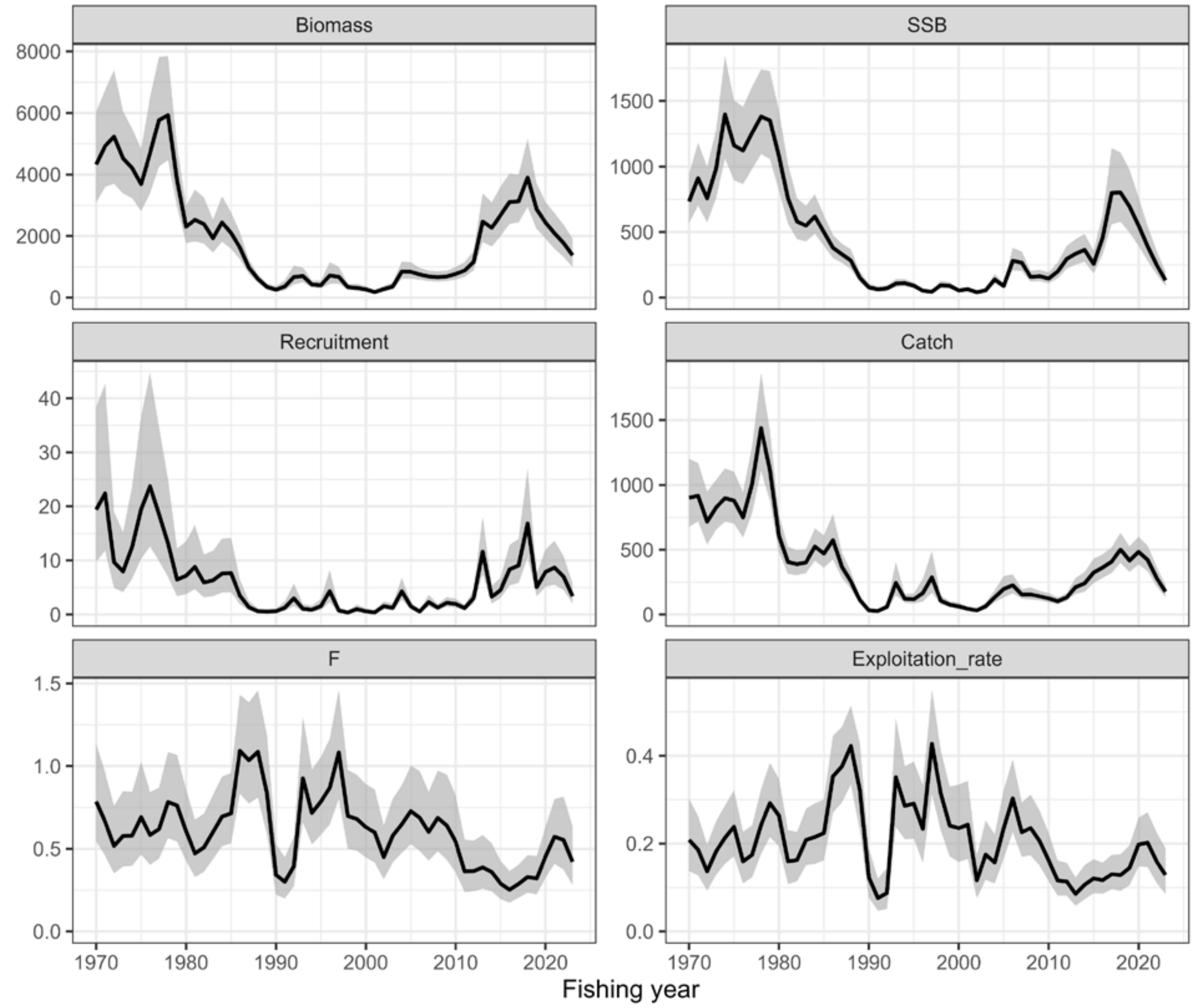

Figure 8. Time series of estimates of total biomass (thousand mt), SSB (thousand mt), recruitment (billion fish), catch (thousand mt), mean fishing mortality (F) and exploitation rate (catch divided by total biomass) from the base case (S02-Index24_1).

Table 1. Reference points for the base case scenario (S02-Index24_1). F-based reference point values that are dependent on time varying parameters are calculated by holding F_{cur} the same for all calculations, but by varying the time period (either FY2016–FY2023 or FY1970–FY2023) over which the biological parameters are estimated. Refer to Glossary in the stock assessment report for the definitions.

Reference Points	Biological parameters	
	FY2016–FY2023	FY1970–FY2023
F-based reference points		
Current%SPR	**16.2**	27.8
$F0.1/F_{cur}$	**0.838**	0.838
$FpSPR.30.SPR/F_{cur}$	**0.580**	0.911
$FpSPR.40.SPR/F_{cur}$	**0.412**	0.609
$FpSPR.50.SPR/F_{cur}$	**0.295**	0.416
$FpSPR.60.SPR/F_{cur}$	**0.207**	0.282
$FpSPR.70.SPR/F_{cur}$	**0.139**	0.184
Biomass-based reference points		
$SSB_{F=0\_RECENT}$	**1399**	–
25th Percentile Historical SSB (SSB_{LIM}) (thousand mt)	**107**	
50th Percentile Historical SSB ($SSB_{REFERENCE\_A}$) (thousand mt)	**289**	
70th Percentile Historical SSB ($SSB_{REFERENCE\_B}$) (thousand mt)	**585**	
SSB_{2023}/ SSB_{LIM}	**1.23**	
SSB_{2023}/ $SSB_{REFERENCE\_A}$	**0.46**	
SSB_{2023}/ $SSB_{REFERENCE\_B}$	**0.23**	
SSB_{LIM} / $SSB_{F=0\_RECENT}$	**0.08**	–
$SSB_{REFERENCE\_A}$ / $SSB_{F=0\_RECENT}$	**0.21**	–
$SSB_{REFERENCE\_B}$ / $SSB_{F=0\_RECENT}$	**0.42**	–

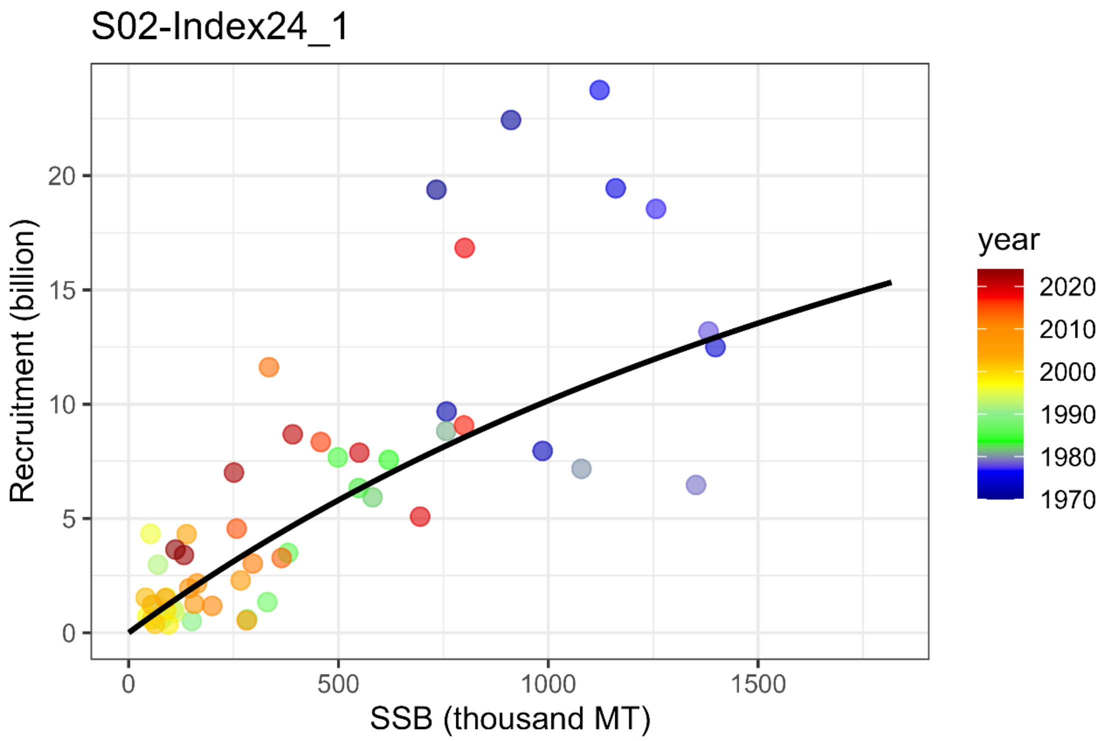

Figure 9. Estimated stock-recruitment curve (black line) and estimated SSB and number of recruits (circles colored by decade), from the selected base case (S02_Index24_1).

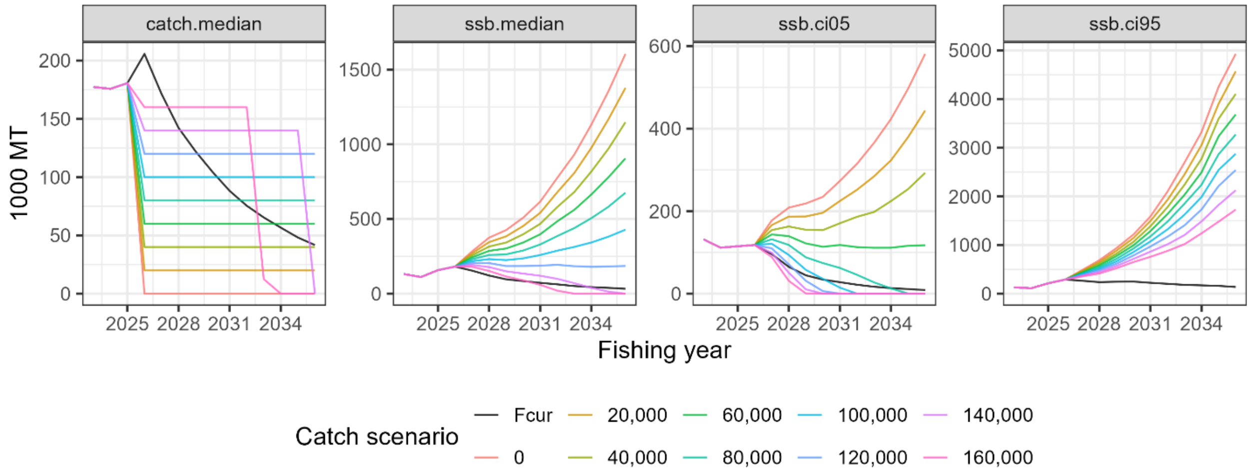

Figure 10. Future trajectories of median catch (left), median SSB (second from left), 5% lower limit of predictive interval for SSB (third from left) and 95% SSB (right) with mean biological parameters in recent 8 years. Numbers and "F_{cur}" in "Catch scenarios" indicate total amount of catches (mt) in constant catch scenarios of 0 to 160 thousand mt in increments of 20 thousand mt and current fishing morality, respectively.

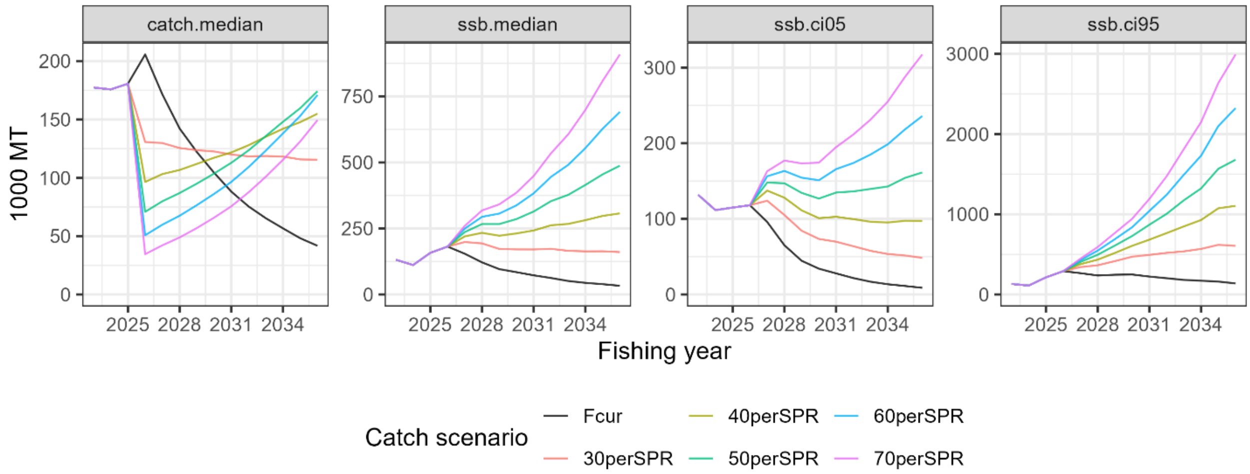

Figure 11. Future trajectories median catch (left), median SSB (second from left), 5% lower limit of predictive interval for SSB (third from left) and 95% SSB (right) with mean biological parameters for the entire time series. 30–70%SPR and "F_{cur}" in "Catch scenarios" indicate total amount of catches (mt) in constant fishing mortality scenarios of F30–70%SPR in increments of 10% and current fishing morality, respectively.

Table 2. Probability that future SSB on July 1, at the beginning of the fishing year, is above $SSB_{REFERENCE\_B}$, $SSB_{REFERENCE\_A}$, and SSB_{LIMIT} (70th percentile, 50th percentile and 25th percentile, respectively) under constant catch projections for the base case scenario. The projection towards FY2036 is shown below.

Pr(SSB > 70th percentile)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Catch000	0	0	0	0	1	12	24	39	54	69	79	85	91	95
Catch010	0	0	0	0	1	10	21	35	49	64	75	81	88	92
Catch020	0	0	0	0	1	9	19	32	45	59	69	77	84	88
Catch030	0	0	0	0	1	7	17	28	41	54	64	73	79	84
Catch040	0	0	0	0	1	6	15	26	38	50	59	67	74	79
Catch050	0	0	0	0	1	6	14	23	34	45	53	62	68	74
Catch060	0	0	0	0	1	5	12	20	30	40	48	56	62	68
Catch070	0	0	0	0	1	4	10	18	27	36	43	50	56	61
Catch080	0	0	0	0	1	4	9	16	24	32	38	44	50	54
Catch090	0	0	0	0	1	3	8	14	21	28	33	39	45	48
Catch100	0	0	0	0	1	3	7	12	18	25	29	34	39	42
Catch110	0	0	0	0	1	2	6	11	16	21	26	29	33	37
Catch120	0	0	0	0	0	2	6	10	14	18	22	25	28	31
Catch130	0	0	0	0	0	2	5	9	12	16	19	21	25	27
Catch140	0	0	0	0	0	1	5	8	11	13	16	19	20	24
Catch150	0	0	0	0	0	1	4	7	9	11	14	16	18	20

Fishing year

Pr(SSB > 50th percentile)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Catch000	0	0	0	5	47	76	82	88	94	97	98	99	99	99
Catch010	0	0	0	5	44	72	78	84	91	95	97	98	98	99
Catch020	0	0	0	5	40	67	73	80	87	92	95	96	98	99
Catch030	0	0	0	5	37	63	68	76	84	89	92	94	96	98
Catch040	0	0	0	5	34	58	64	71	80	85	88	91	93	95
Catch050	0	0	0	5	32	54	58	66	74	80	83	86	90	91
Catch060	0	0	0	5	29	49	53	61	68	74	78	81	84	86
Catch070	0	0	0	5	27	45	48	55	62	68	72	75	77	80
Catch080	0	0	0	5	25	40	44	50	56	61	65	69	71	73
Catch090	0	0	0	5	22	36	39	45	51	56	58	61	63	65
Catch100	0	0	0	5	21	32	34	41	45	50	53	55	56	58
Catch110	0	0	0	5	19	29	31	36	40	44	46	48	50	51
Catch120	0	0	0	5	18	26	27	33	36	39	40	42	44	44
Catch130	0	0	0	5	16	23	25	30	32	34	35	36	37	38
Catch140	0	0	0	5	15	21	22	26	29	30	30	31	32	32
Catch150	0	0	0	5	13	18	20	23	25	26	26	26	27	27

Fishing year

Percent: 0, 25, 50, 75, 100

Pr(SSB > 25th percentile)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Catch000	100	100	98	98	100	100	100	100	100	100	100	100	100	100
Catch010	100	100	98	98	100	100	100	100	100	100	100	100	100	100
Catch020	100	100	98	98	100	100	100	100	100	100	100	100	100	100
Catch030	100	100	98	98	100	100	99	99	100	100	100	100	100	100
Catch040	100	100	98	98	100	100	99	99	99	99	99	99	99	99
Catch050	100	100	98	98	100	99	98	97	98	98	98	98	98	98
Catch060	100	100	98	98	99	98	96	96	96	95	95	95	95	95
Catch070	100	100	98	98	99	97	95	93	93	92	92	92	92	92
Catch080	100	100	98	98	99	96	92	90	89	88	87	87	86	85
Catch090	100	100	98	98	98	95	89	85	84	83	81	80	79	79
Catch100	100	100	98	98	98	92	84	80	78	76	74	73	72	71
Catch110	100	100	98	98	97	90	80	74	72	69	67	65	63	62
Catch120	100	100	98	98	96	86	75	68	65	62	60	58	56	55
Catch130	100	100	98	98	94	82	69	62	59	55	52	50	49	47
Catch140	100	100	98	98	92	78	63	57	52	49	45	43	42	41
Catch150	100	100	98	98	91	74	58	51	47	43	40	38	36	34

Fishing year

Table 3. Probability that future SSB on July 1, at the beginning of the fishing year, is above $SSB_{REFERENCE\_B}$, $SSB_{REFERENCE\_A}$, and SSB_{LIMIT} (70th percentile, 50th percentile and 25th percentile, respectively) under constant fishing mortality projections for the base case scenario. The projection towards FY2036 is shown below.

Pr(SSB > 70th percentile)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
F70pSPR	0	0	0	0	1	5	13	21	32	44	52	61	68	74
F65pSPR	0	0	0	0	1	4	11	18	28	38	46	54	62	67
F60pSPR	0	0	0	0	1	4	9	15	23	33	40	47	54	59
F55pSPR	0	0	0	0	1	3	7	13	19	27	33	39	45	50
F50pSPR	0	0	0	0	1	2	6	10	16	22	26	31	35	40
F45pSPR	0	0	0	0	0	2	4	8	11	15	19	23	26	31
F40pSPR	0	0	0	0	0	1	3	6	8	11	13	16	18	20
F35pSPR	0	0	0	0	0	1	2	4	5	6	8	10	10	12
F30pSPR	0	0	0	0	0	0	2	2	3	4	4	5	6	5
F2021-2023	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Fishing year

Pr(SSB > 50th percentile)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
F70pSPR	0	0	0	5	36	60	65	71	80	86	89	92	95	96
F65pSPR	0	0	0	5	33	56	60	67	75	82	85	89	92	94
F60pSPR	0	0	0	5	31	52	55	62	70	77	81	84	88	90
F55pSPR	0	0	0	5	28	47	49	56	64	70	75	78	82	84
F50pSPR	0	0	0	5	25	41	43	49	55	63	67	70	73	77
F45pSPR	0	0	0	5	22	34	36	42	48	54	56	61	64	66
F40pSPR	0	0	0	5	19	28	28	34	39	44	45	48	52	53
F35pSPR	0	0	0	5	16	22	21	25	29	32	33	35	37	38
F30pSPR	0	0	0	5	12	16	15	18	20	21	22	22	23	24
F2021-2023	0	0	0	5	3	2	3	3	3	1	2	1	1	1

Fishing year

Percent: 0, 25, 50, 75, 100

Pr(SSB > 25th percentile)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
F70pSPR	100	100	98	98	100	100	100	100	100	100	100	100	100	100
F65pSPR	100	100	98	98	100	100	100	100	100	100	100	100	100	100
F60pSPR	100	100	98	98	100	100	99	99	100	100	100	99	100	100
F55pSPR	100	100	98	98	100	100	99	99	99	99	99	99	99	99
F50pSPR	100	100	98	98	100	100	98	98	98	98	98	98	98	99
F45pSPR	100	100	98	98	100	99	98	96	97	97	96	96	97	97
F40pSPR	100	100	98	98	99	98	96	93	94	94	93	93	93	93
F35pSPR	100	100	98	98	99	97	92	89	89	88	86	86	85	84
F30pSPR	100	100	98	98	99	95	86	81	79	77	75	72	71	70
F2021-2023	100	100	98	98	88	63	41	35	27	21	17	14	11	9

Fishing year

Table 4. Median catch and median SSB based on constant-catch scenarios (ranging from 0 mt to 150 thousand mt).

Median Catch

Scenario														
Catch000	177	176	181	0	0	0	0	0	0	0	0	0	0	0
Catch010	177	176	181	10	10	10	10	10	10	10	10	10	10	10
Catch020	177	176	181	20	20	20	20	20	20	20	20	20	20	20
Catch030	177	176	181	30	30	30	30	30	30	30	30	30	30	30
Catch040	177	176	181	40	40	40	40	40	40	40	40	40	40	40
Catch050	177	176	181	50	50	50	50	50	50	50	50	50	50	50
Catch060	177	176	181	60	60	60	60	60	60	60	60	60	60	60
Catch070	177	176	181	70	70	70	70	70	70	70	70	70	70	70
Catch080	177	176	181	80	80	80	80	80	80	80	80	80	80	80
Catch090	177	176	181	90	90	90	90	90	90	90	90	90	90	90
Catch100	177	176	181	100	100	100	100	100	100	100	100	100	100	100
Catch110	177	176	181	110	110	110	110	110	110	110	110	110	110	110
Catch120	177	176	181	120	120	120	120	120	120	120	120	120	120	120
Catch130	177	176	181	130	130	130	130	130	130	130	130	130	130	130
Catch140	177	176	181	140	140	140	140	140	140	140	140	140	140	0
Catch150	177	176	181	150	150	150	150	150	150	150	150	26	0	0

Fishing year: 2022, 2026, 2030, 2034

1,000 MT: 150, 100, 50, 0

Median SSB

Scenario														
Catch000	132	112	158	181	283	375	426	509	617	776	932	1132	1355	1605
Catch010	132	112	158	181	277	360	405	481	578	728	870	1054	1263	1491
Catch020	132	112	158	181	270	345	384	453	542	679	808	977	1168	1378
Catch030	132	112	158	181	264	330	364	424	506	630	747	895	1069	1265
Catch040	132	112	158	181	257	316	342	398	468	580	681	818	970	1148
Catch050	132	112	158	181	251	301	322	370	432	535	622	743	878	1017
Catch060	132	112	158	181	243	287	303	342	398	485	562	664	779	906
Catch070	132	112	158	181	237	273	283	314	363	434	501	583	684	790
Catch080	132	112	158	181	231	259	263	289	330	386	439	506	582	676
Catch090	132	112	158	181	224	245	243	262	295	338	377	422	479	559
Catch100	132	112	158	181	218	231	225	236	259	288	313	343	382	428
Catch110	132	112	158	181	211	218	205	211	222	240	248	265	283	305
Catch120	132	112	158	181	205	205	185	185	187	194	184	180	182	186
Catch130	132	112	158	181	199	191	167	160	155	144	122	104	89	66
Catch140	132	112	158	181	193	178	150	135	120	99	70	39	14	0
Catch150	132	112	158	181	187	165	131	112	88	57	23	0	0	0

Fishing year: 2022, 2026, 2030, 2034

1,000 MT: 1600, 1200, 800, 400

Table 5. Median catch and median SSB based on projections using constant F scenarios.

Median Catch (1,000 MT)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
F70pSPR	177	176	181	35	42	49	57	66	76	88	101	116	131	149
F65pSPR	177	176	181	42	51	58	67	76	87	99	113	128	144	163
F60pSPR	177	176	181	51	60	68	77	86	97	109	123	138	153	171
F55pSPR	177	176	181	60	70	77	86	95	105	118	131	145	159	175
F50pSPR	177	176	181	71	80	87	95	104	113	124	136	148	160	174
F45pSPR	177	176	181	83	91	97	104	111	118	127	137	147	156	168
F40pSPR	177	176	181	96	103	107	112	117	122	128	135	142	148	155
F35pSPR	177	176	181	112	116	116	119	121	123	125	129	133	134	138
F30pSPR	177	176	181	131	130	126	124	123	120	118	119	118	116	116
F2021-2023	177	176	181	206	171	142	122	104	88	75	65	57	48	42

Fishing year

Median SSB (1,000 MT)

Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
F70pSPR	132	112	158	181	260	318	341	386	449	534	606	699	809	909
F65pSPR	132	112	158	181	255	307	325	362	416	490	548	626	717	797
F60pSPR	132	112	158	181	249	294	306	338	383	445	491	554	628	691
F55pSPR	132	112	158	181	243	281	287	312	349	399	434	485	540	587
F50pSPR	132	112	158	181	236	267	267	286	314	353	377	415	455	488
F45pSPR	132	112	158	181	229	251	245	259	279	308	322	346	372	393
F40pSPR	132	112	158	181	220	233	222	231	242	262	267	281	297	307
F35pSPR	132	112	158	181	210	215	198	201	207	217	214	220	227	229
F30pSPR	132	112	158	181	199	194	173	171	171	173	165	163	164	161
F2021-2023	132	112	158	181	154	122	96	84	73	63	51	44	39	33

Fishing year

Annex E:

Timeline and intersessional activities before the TWG CMSA12 meeting

<table>
<tr><th colspan="2">Month</th><th>SA report</th><th>Catch@Age</th><th>Weight@Age</th><th>Maturity@Age</th><th>Abundance indices</th><th>Rescheduling of TWG CMSA</th><th>Paper on COM09 tasks</th></tr>
<tr><td rowspan="3">Aug</td><td>Early</td><td rowspan="7">Email communication</td><td></td><td></td><td></td><td></td><td rowspan="3">Email communication</td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Late</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Sep</td><td>Early</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Late</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Oct</td><td>Early</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mid</td><td>One-day intersessional meeting (Finalization and adoption of SA report)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Late</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Nov</td><td>Early</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mid</td><td>Submit to SC10</td><td></td><td></td><td></td><td></td><td></td><td>Submit to SC10</td></tr>
<tr><td>Late</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Dec</td><td>Early</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mid</td><td colspan="7">SC10 (hybrid) 16-19 Dec</td></tr>
<tr><td>Late</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Jan	Early		Submit CAL and CAA up to 2nd quarter of 2025 by 10 Jan	Submit WAA up to 2nd quarter of 2025 by 10 Jan	Submit MAA up to 2nd quarter of 2025 by 10 Jan	Submit updated standardized abundance indices up to FY2024 (FY2025 if possible)		
	Mid							
	Late		Working paper due 25 Jan					
Feb	Early		Data Managers conduct data compilation					
	Mid							
	24-27		TWG CMSA12 (virtual)					

Annex F:

Species summary for chub mackerel

Chub mackerel (*Scomber japonicus*)

Common names:

鲐鱼, Taiyu (China)

マサバ, Masaba (Japan)

고등어, Godeungeo (Korea)

Японская скумбрия, Yaponskaya skumbriya (Russia)

白腹鯖, Bai-Fu-Qing (Chinese Taipei)

Management

Active NPFC Management Measures

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

- CMM 2025-07 For Chub Mackerel

Available from https://www.npfc.int/cmm-2025-07-chub-mackerel

Management Summary

The current conservation and management measure (CMM) for Chub mackerel specifies catch limits. The CMM states that Members and Cooperating non-Contracting Parties currently harvesting Chub mackerel should refrain from expansion of the number of fishing vessels authorized to fish Chub mackerel in the Convention Area.

Additionally, the Commission established the annual total allowable catch of chub mackerel in the Convention Area as a provisional measure until the Scientific Committee adopts NPFC stock assessment of chub mackerel and the Commission accordingly revises this CMM. The annual total allowable catch of chub mackerel in the Convention Area, excluding the amount in paragraph 11, shall be set at 66,740 tons for each of the 2024 fishing seasons. Of this annual total allowable catch, the catch for trawlers shall not exceed 7,940 tons and the catch for purse seiners shall not exceed 58,800 tons for each of the 2025 fishing seasons. China shall not authorize more than 3 trawlers and the EU shall not authorize more than 1 trawler to conduct fishing operations at the same time. In addition to the above fishing opportunities, the EU shall be entitled to fish an additional 4,260 tons of chub mackerel for each of the 2025 fishing seasons.

To comply with this provisional measure, Members of the Commission shall report to the Executive Secretary, in electronic format, their monthly catches of chub mackerel in the Convention Area.

Convention/Management Principle	Status	Comment/Consideration
Biological reference point(s)	🔴	The TWG CMSA agreed to base its future discussions on the following candidate biological reference points: (a) F-based reference points i. F_{MSY} ii. $F_{\%SPR}$ iii. $F_{0.1}$, F_{max} (b) Biomass-based reference points (including SSB, summary biomass, etc.) i. B_{MSY} ii. $\%B_0$ iii. Certain historical level of B
Stock status	⚪	Status determination criteria not established.
Catch limit	🟡	66,740 mt for CA
Harvest control rule	🔴	Not established.
Other	🟡	Encouragement to refrain from expansion,

	in the Convention Area, of the number of fishing vessels.

OK Intermediate Not accomplished Unknown

Assessment

The Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA) completed the stock assessment at its 11th meeting in July 2025. A State-space Stock Assessment Model (SAM) was used for the stock assessment. China, Japan and Russia submitted catch-at-age data up to the 2023 fishing year (June 2024) for the base case scenario. The TWG agreed on the stock assessment results (see TWG CMSA11 report for details).

Data

Surveys

China has been conducting a scientific survey program using its fishery research vessel "Song Hang" with mid-trawl as the main survey gear in the NPFC convention area since 2021 (Ma et al. 2023).

Japan annually conducts two mid-water trawls surveys in summer (2001–2024) and autumn (1995–2024) that serve information on recruitment abundance indices of age-0 fish to the Japanese domestic stock assessment of the Pacific stock of Chub mackerel (Table 1) (Nishijima et al. 2025a, Higashiguchi et al. 2025). The autumn mid-water trawl survey also provides age-1 fish abundance indices for the stock assessment. Japan also conducts a year-round egg survey (2005–2024) providing egg density as index of spawning stock biomass for the stock assessment (Nishijima et al. 2025b). The survey protocol can be found at Oozeki et al. (2007).

Russia has conducted a summertime acoustic-trawl survey since 2010 that examines mid-water and upper epipelagic species including Chub mackerel.

Fishery

China, Japan and Russia catch Chub mackerel (Figure 1). China harvests this species dominantly by light purse seine fishery in the NPFC Convention Area. A smaller component of the catch is taken by pelagic trawl. Chinese catch statistics on mackerels in the NPFC Convention Area are available from 2015. The Chinese mackerel fisheries in the NPFC Convention Area initiated in 2014 mainly caught the three fish species such as Chub mackerel, blue mackerel, and Japanese sardine (Zhang et al. 2023). Chub mackerel catch accounts for 75% to 94%, 88% on average, in the mackerels catch up to 2023.

Japan's fishery for Chub mackerel occurs inside their Exclusive Economic Zone (EEZ) and is mostly conducted by large purse seine vessels (≥50% of the catch). Additional components of the fishery include set nets, dip nets and other gears. Proportion of Chub mackerel catch in mackerels catch is obtained through extensive port sampling. The Chub mackerel catch accounts for 69% to 92%, 86% on average, of the mackerels catch in 2014-2023.

The Russian fisheries catching mackerels are operated in their EEZ and is prosecuted primarily by mid-water trawling (>90% of the catch), with a smaller component of the catch coming from purse seiners and bottom trawlers. The Russian mackerels catch, comprising approximately 100% of Chub mackerel, are available in the NPFC Annual Summary Footprint since 2014.

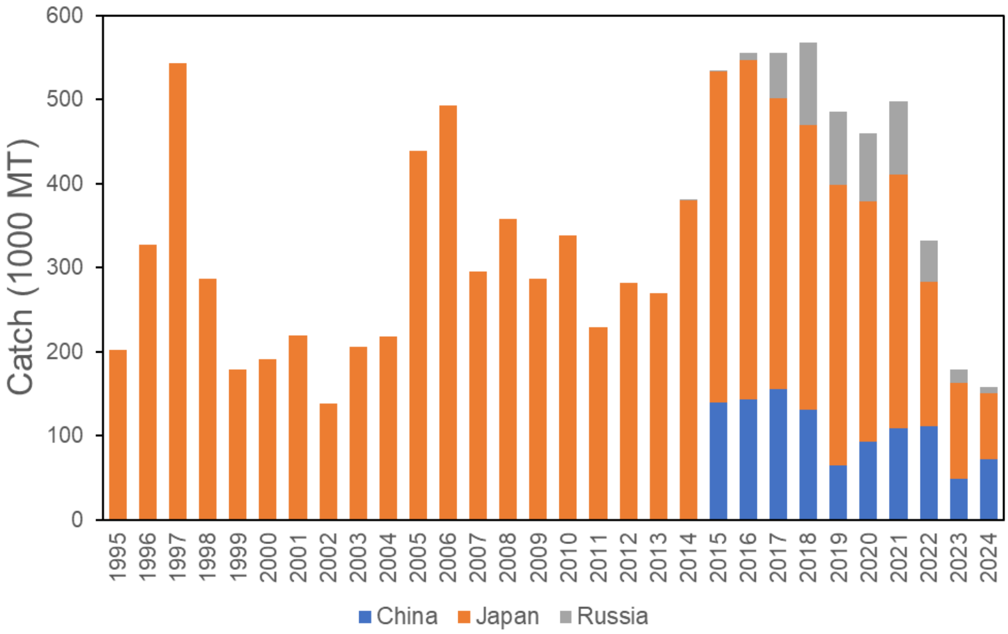

Figure 1. Historical catch of mackerels obtained from the annual summery footprint of Chub and Blue mackerels.

Other NPFC Members (Canada, EU, Korea, Chinese Taipei, USA and Vanuatu) do not have Chub mackerel catch records in the NPFC Convention Area.

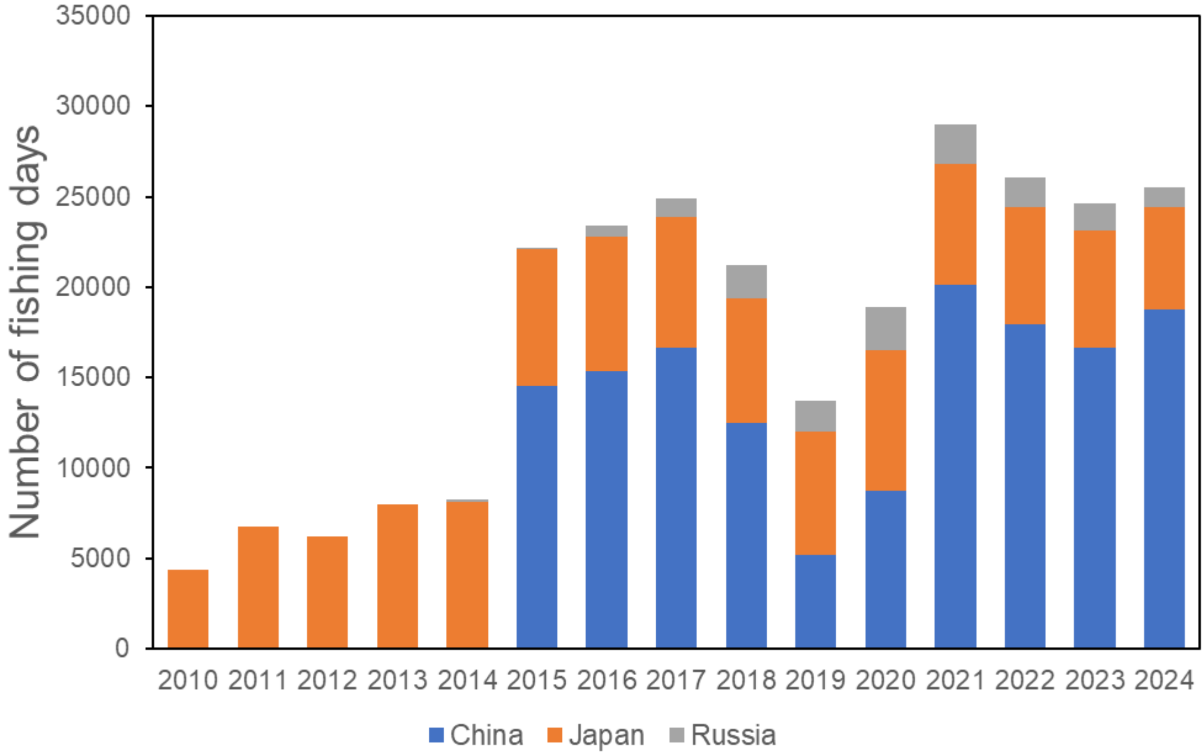

Figure 2. Historical fishing effort for mackerels obtained from the annual summary footprint of Chub and Blue mackerels. Fishing efforts of Japan were derived from purse seine and bottom trawl.

Biological collections

China has collected length frequency data of commercial catch through onboard and port samplings since 2016. Aging of the samples has been started since 2017.

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

Russian length frequency and aging data of commercial catch are available since 2016. The length frequency data obtained through research surveys are available since 2010.

Table 1: Data availability from Members regarding Chub mackerel.

Category and data sources	Description	Years with available data	Average sample size/year or data coverage	Potential issues to be reviewed
JAPAN				
Catch statistics				
Purse seine fishery	Official statistics, reports from fisheries associations and markets	Official statistics: 1950-2024, other reports: 1970-2024	Coverage=100%	The Chub mackerel catches are estimated from Chub and blue mackerel catches based on port sampling data for purse seine and set net fisheries. No detailed information of the ratio is presented.
Dip net fishery				
Set net				
Size composition data				
Length measurements	Port sampling by 17 local fishery institutes in 17 prefectures	1970-2024	20,000-120,000 (average 40,000) fish/year (ca. 100 measurements per sampling)	Detailed information in NPFC-2020-TWG CMSA03-WP02.
Aging	Port sampling by 17 local fishery institutes in 17 prefectures	1970-2024	500-1000 fish/year	Detailed information in NPFC-2020-TWG CMSA03-WP02.
Catch at age (CAA)	Estimate CAA from the above data	1970-2024	Age-length keys are created approximately by quarter and local regions	Evaluate uncertainty of catch at age; Changes of growth depending on recruitment abundance is reviewed in NPFC-

				2022-TWG CMSA05-IP06 and published as Kamimura et al (2022, https://doi.org/10.1093/icesjms/fsab191)
Abundance indices (survey)				
Spring survey for recruitment	Mainly for sardine and Chub mackerel of pre-recruits. This research is conducted for biological research of early life history. Mid-water trawl	1995-2024	30-60 stations/year	Too early for the use of abundance index
Summer survey for recruitment	Mainly for saury, mid-water trawl	2001-2024	60-80 stations/year	Detailed information on data and standardization is in NPFC-2022-TWG CMSA06-WP11 (Rev.1). Detailed sampling design and method are shown in Hashimoto et al. (2020, https://doi.org/10.1007/s12562-020-01407-3).
Autumn survey for recruitment and age 1 fish	Mainly for sardine and Chub mackerel, mid-water trawl	1995-2024	30-60 stations/year	Detailed information on data and standardization for recruitment is in NPFC-2022-TWG CMSA06-WP11 (Rev.1). That for age 1 has not been presented.

Year-round for egg density	Almost all local fishery institutes join this survey program. NORPAC net. Not only for Chub mackerel.	1978-2024 (2005-, species identification between Chub and blue mackerel)	ca. 6000 stations in total, 1000-4000 stations with Chub mackerel eggs/year	Detailed information on data and standardization is in NPFC-2022-TWG CMSA06-WP10
Abundance indices (commercial)				
Dip net fishery	Log book data are collected from fishermen in Kanagawa prefecture since 2003 and Shizuoka prefecture since 2013 (ca. 10 and 90% of total dip net catch in 2017, respectively)	2003-2024	10-100/year	Detailed information on its data and standardization is in NPFC-2022-TWG CMSA06-WP09
RUSSIA				
Catch statistics				
Purse seine fishery	Official statistics, reports from fisheries associations	Official statistics: 1980-1993, 2015-2024, 1994-2014 (no data available); publications: 1970-2024	Coverage 1980-1993 =NA; Coverage 2015-2023 =100%	Data coverage details to be reviewed
Pelagic trawl fishery				
Size composition data				
Length measurements	Sampling from commercial fishing vessels. Sampling during research surveys.	2016-2024 2010-2024	1,000-10,000 fish/year (ca. 100 measurements per sampling)	Data coverage details to be reviewed
Aging	Sampling during research surveys and from commercial fishing vessels	2016-2024	300-500 fish/year	Details to be reviewed
Catch at age	Estimate CAA from the	2016-2024	Age-length keys	Evaluate

(CAA)	above data		are to be developed	uncertainty of catch at age, especially on changes of growth depending on recruitment abundance
Abundance indices (survey)				
Summer trawl and acoustic (echointegration) surveys to assess pelagic fish abundance and recruitment	Mid-water upper epipelagic surveys	2010-2024 (June-July) 2015-2024 (July-September)	60-80 stations/year 60-80 stations/year	Changes in abundance and migration patterns; development survey protocol and conduct standardization
Abundance indices (fishery)				
Daily reports of catch by each vessel	Target (>50%) Mid-water trawls	2015-2024 May-December		Test the effect of targeting
CHINA				
Catch statistics				
Purse seine fishery	Official statistics, reports from annual report	Official statistics：2014-2024	Coverage=100%	The Chub mackerel catches are from the fishing catch provided by the fishery company
Trawl fishery	Official statistics, reports from annual report	Official statistics: 2014-2024	Coverage=100%	Catches are from the fishing catch provided by the fishery company
Size composition data				
Length measurements	Port sampling by Institute and technology group.	2016-2024	550-800 fish/year	Details to be reviewed
Length measurements	Purse seine vessel sampling from commercial vessel	2016-2024	530-1050 fish/year	Details to be reviewed
Aging	Sampling during	2017-2024	30-180 fish/year	Details to be

	research surveys and from commercial fishing vessels			reviewed
Abundance indices (commercial)				
Purse seine fishery	Purse seine logbook (Technical group for Chub mackerel Fishery, Distant-water Fishery Society of China)	2014-2024 April-December	10-105/year	Review survey protocol and conduct standardization

Special Comments

None

Biological Information

Distribution

The Pacific stock of Chub mackerel is distributed from the southern coastal waters on the Pacific side of Japan to offshore area off the Kuril Islands (Figure 3). This stock corresponding to straddling one is harvested in both national waters of Japan and Russia and the NPFC Convention Area. Adult fish spawn in Izu Islands waters in spring and then engage northward feeding migration to waters of Sanriku to east Hokkaido from summer to autumn.

Life history

Longevity of Chub mackerel is estimated to be 7 or 8 years old. There was the oldest record of 11 years old. It is known that growth of this stock could be changed according to recruitment abundance and oceanic environment (Watanabe and Yatsu 2004). Recent decrease in mean weight by age was highly likely induced by feeding competition in conjunction with intra-/inter-specific increase of density resulted from biomass increases of Chub mackerel and Japanese sardine (Kamimura et al. 2021). Adult female spawns more than once during a spawning season. Maturity at age was changed depending on changes in growth (Watanabe and Yatsu 2006).

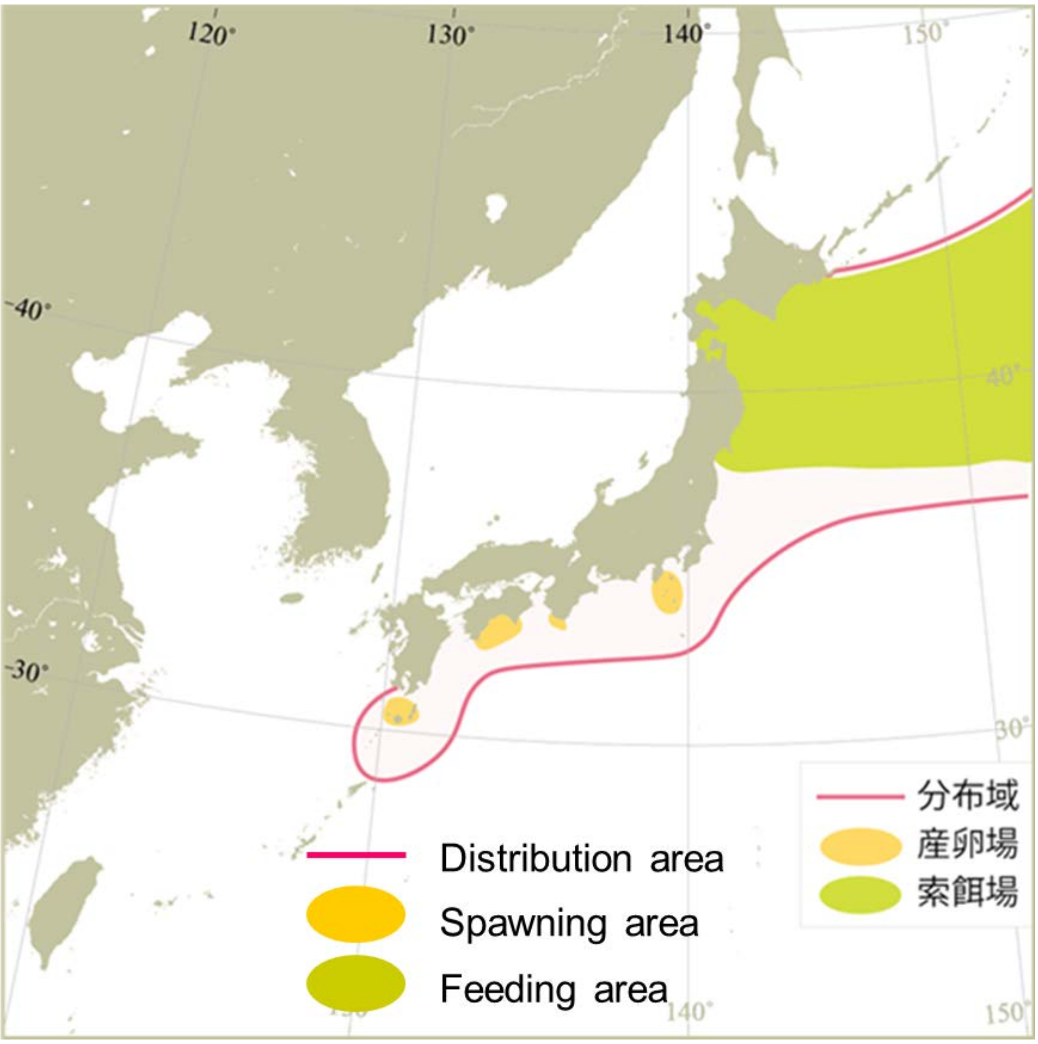

Figure 3. Map of distribution of Chub mackerel in the North Pacific (Yukami et al. 2025).

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