North Pacific Fisheries Commission

5th Meeting of the Technical Working Group on Chub Mackerel Stock Assessment

REPORT

16-19 May 2022

June 2022

This paper may be cited in the following manner:

5th Meeting of the Technical Working Group on Chub Mackerel Stock Assessment. 2022. 5th Meeting Report. NPFC-2022-TWG CMSA05-Final Report. 24 pp. (Available at www.npfc.int)

2nd Floor Hakuyo Hall
Tokyo University of Marine Science and Technology
4-5-7 Konan, Minato-ku, Tokyo
108-8477 JAPAN

TEL +81-3-5479-8717
FAX +81-3-5479-8718
Email secretariat@npfc.int
Web www.npfc.int

North Pacific Fisheries Commission
5th Meeting of the Technical Working Group on Chub Mackerel Stock Assessment

16-19 May 2022
WebEx

REPORT

Agenda Item 1. Opening of the Meeting

1. The 5th Meeting of the Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA) of the North Pacific Fisheries Commission (NPFC) took place in the format of video conferencing via WebEx, and was attended by Members from Canada, China, the European Union (EU), Japan, and the Russian Federation. Dr. Jim Ianelli attended as a Secretariat Guest in his role as a Panelist for the first NPFC Performance Review. An invited expert, Dr. Joel Rice, participated in the meeting.

2. The meeting was opened by the TWG CMSA Chair, Dr. Vladimir Kulik (Russia). Mr. Alex Meyer was selected as rapporteur.

Agenda Item 2. Adoption of Agenda

3. The Agenda was adopted without revision (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 4th TWG CMSA and 6th SC meetings

4. The Chair provided an overview of the 4th TWG CMSA meeting and its recommendations, which the 6th Scientific Committee (SC) meeting endorsed and recommended to the Commission.

3.2 7th Commission meeting

5. The Science Manager, Dr. Alex Zavolokin, reported that the 7th Commission meeting was postponed and that the new dates for the meeting are still under discussion among Members.

3.3 Intersessional meetings of SWG OM

6. The Lead of the Small Working Group on Operating Model (SWG OM), Dr. Shota Nishijima (Japan), provided an overview of the discussions and outcomes of the 2nd intersessional meeting of the SWG OM (NPFC-2022-TWG CMSA05-WP01).

Agenda Item 4. Review of Terms of Reference and Protocols of the TWG CMSA

4.1 Terms of Reference

7. The TWG CMSA reviewed the Terms of Reference and determined that no revisions are currently required.

4.2 CPUE Standardization Protocol

8. The TWG CMSA reviewed the CPUE Standardization Protocol and determined that no revisions are currently required.

4.3 Stock Assessment Protocol

9. The TWG CMSA reviewed the Stock Assessment Protocol and determined that no revisions are currently required.

4.4 Protocol for the Operating Model Development

10. The TWG CMSA reviewed the Protocol for the Operating Model Development and determined that no revisions are currently required.

11. The TWG CMSA reaffirmed that the decision on selecting the stock assessment model will be made by the TWG CMSA, based on technical work and discussions conducted by the SWG OM.

Agenda Item 5. Review of Member's fisheries and research activities

5.1 Description of fisheries, inter alia, fishing seasons and fishing grounds

5.2 Research activities

12. China presented a review of its chub mackerel fishery and research activities (NPFC-2022-TWG CMSA05-IP02 & IP03). In 2021, China operated 105 purse seine vessels and 3 trawl vessels in the Convention Area. Total catch was 108,266 mt with higher catch at 40-44 degrees north latitude than in the other areas. The average length of caught individuals was 246 mm. The trend in average fork length from 2016-2021 was a gradual increase to a stable level. The main age at catch in 2021 was 2+ and 3+. China collects and analyzes fishing logbooks every year and sends research specialist staff to fishing vessels or ports to collect sample data. It is also providing annual training for fishermen and enterprises.

13. Russia presented a review of its chub mackerel fishery and research activities in 2021 (NPFC-2022-TWG CMSA05-IP01). In 2021, the main fishing grounds were in the Japanese exclusive economic zone (EEZ) from January to March, before shifting to open waters in May, then to the Russian EEZ from June, and back to the Japanese EEZ in November and December. Monthly catch-per-unit-effort (CPUE) was highest in January, February, March, and December. Monthly catch was highest in January, February, October, and December. From 2016 to 2021, total annual catch was highest in 2018, followed by 2021 (87,388 mt). In terms of research activities, Russia conducted two multipurpose and multispecies trawling surveys in the upper epipelagic zone of the Northwestern Pacific Ocean in 2021, the first in June-July and the second in August-September.

14. Japan presented a review of its chub mackerel fishery and research activities (NPFC-2022-TWG CMSA05-IP05). 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 catch is from large-scale purse seine vessels. Monthly catch follows the same pattern across recent years, with lower catch in May to September, and higher catch in autumn and winter. The map of quarterly fishing effort shows the same seasonal change across recent years, with a lot of effort in the northern part of Japan in the fourth quarter. The map of quarterly catch follows the same pattern as the quarterly effort map. In terms of research, Japan conducted recruitment surveys in summer and autumn. The CPUEs of the two surveys are used as recruitment indices. The CPUEs of its dip net fishery and egg survey are used as spawning stock biomass (SSB) indices. The CPUE in 2019 decreased relative to 2018 and remained higher compared to before 2010. Japan also conducts an annual domestic stock assessment using virtual population analysis (VPA). The results indicate that recruitment has remained at a higher level after a strong cohort in 2013, SSB has been at a higher level since 2014, and the exploitation rate has been at a historically lower level after 2010.

15. The TWG CMSA held further discussions on a standardized approach for aggregating catch-at-age data for future stock assessment of chub mackerel. For the development of the operating model, Japan has been aggregating data by a fishing year beginning in July, while China and Russia have been aggregating data by calendar year. Japan pointed out that aggregating the data by a fishing year beginning in July better reflects the biology and ecology of chub mackerel. China and Russia explained that changing the way they aggregate their data could create issues and additional work, and that developing calendar-year-based management measures from a stock assessment based on a fishing year could be problematic. Japan suggested that, as a compromise, a fishing year starting in April could be used. Further discussions were held under

agenda item 7.3 (see paragraphs 43-44).

Agenda Item 6. Stock assessment model for chub mackerel

6.1 Progress of the intersessional works

16. China presented an updated stock assessment based on age-structured assessment program (ASAP) for the operating model for chub mackerel in the North Pacific Ocean in 2022 (NPFC-2022-TWG CMSA05-WP04). The biomass of chub mackerel was at a high level before 1980, then declined to a low value, before recovering since 2005, with a similar trend for abundance and spawning stock biomass (SSB). During 1985-2005, fishing mortality for chub mackerel was high and stock abundance was very low.

17. China presented a stock assessment based on a Bayesian state-space production model (BSSPM) for the operating model for chub mackerel in the North Pacific Ocean (NPFC-2022-TWG CMSA05-WP05). The input data and base case scenario were confirmed by TWG CMSA04. However, due to the model assumptions of BSSPM, different natural mortality, maturity and weight matrix could not be considered in the stock assessment. The estimated median B_{2019} from the base case scenario was 562 (80%CI 121 - 1,081) $\times 10^4$ metric tons. The median B_{2019}/B_{MSY} and F_{2019}/F_{MSY} were 1.53 (80%CI 0.51 - 2.08) and 0.22 (80%CI 0.07 - 0.37), respectively. During the most recent years, the biomass of chub mackerel remained at a high value, with relatively low fishing mortality. The probability of the population being in the green Kobe quadrant in 2019 was estimated to be greater than 77%.

18. Japan pointed out that the shape of the posterior distribution for some parameters was unusual and asked China for further clarification. China pointed out that this kind of wide range is common due to specifications such as non-informative priors and acceptable for posterior distributions, but agreed that work could be done to improve it if needed, such as increasing the number of MCMC iterations or setting informative priors.

19. Japan noted that in the Kobe plot for the BSSPM results, F remains below F_{MSY} but B fluctuates, and suggested that the process errors estimated for each year be checked as they may be having a large influence on the results.

20. Russia presented an updated preliminary chub mackerel stock assessment using cohort analysis with Kalman filter (KAFKA) and using all indices provided by Members for six scenarios (NPFC-2022-TWG CMSA05-WP07). The analysis has been updated following SWG OM02 by correctly applying the M values. Maximum SSB estimates were obtained for scenarios with the highest weight and maturity values. Fishing mortality had similar dynamics for all scenarios,

with the exception of the last 5 years. For scenarios with higher estimates of maturity at age, the estimate of fishing mortality was the highest. Retrospective analysis showed no serious biases under the base-case scenarios. Biological reference points based on hockey-stick stock-recruitment relationship were estimated. Across all scenarios, the best matches were observed for the abundance indices.

21. Japan pointed out that it had submitted a paper to Russia with questions about some model configurations of KAFKA at SWG OM02. Russia stated that it would provide the answers to the extent possible by 31 May 2022, explaining that some of the answers can only be provided by the developer of the model.

22. Japan presented the updated results of tuned VPA and state-space assessment model (SAM) under the determined scenarios to include biological uncertainties on natural mortality, weight, and maturity (NPFC-2022-TWG CMSA05-WP06). A few model configurations were changed from the previous analysis to avoid overfitting and stabilize parameter estimation, which will be useful for the application of these models to pseudo-data generated from the operating model. Abundance estimates were lower compared to the previous assessment due to the change in M, but qualitative results have not changed significantly. SAM demonstrated lower retrospective bias than VPA.

23. The SWG OM Lead summarized the intersessional progress made since SWG OM02 and remaining issues.

6.2 Data generation by PopSim as input to the candidate stock assessment models

24. The invited expert explained the process of generating pseudo data using PopSim as input to the candidate stock assessment models and the progress to date. Pseudo data have been developed, checked and disseminated to the SWG OM. The SWG OM is in the process of running models on pseudo data and summarizing the results. Results will be compared to the true data results via the performance measures.

25. The NPFC Performance Review Panelist noted that PopSim has limited capabilities. It may be worthwhile to compare the simulated data (graphically) with real data side by side. A "Turing test" (computer-generated vs human-collected data) may help provide context for simulation-testing the models.

26. The TWG CMSA reviewed the progress and suggested technical improvements for generating new pseudo data, including:

(a) an alternative method of estimating selectivity for the KAFKA model.
(b) incorporating the dynamics of ages 7-14 (age classes 8-15 in the PopSim setting).
(c) an alternative method of incorporating the non-linear exponent and observation error.

27. The TWG CMSA agreed that pseudo data originated from different stock assessment models under the same scenario will be randomized and summarized into a single pseudo dataset.

6.3 Report on the performance of the candidate stock assessment models

28. The invited expert explained that he is currently waiting for Members to submit their results for the newest pseudo data, after which he will compare the results to the true data.

29. Japan presented a first analysis of the fitting of VPA and SAM to pseudo data generated from PopSim for chub mackerel in the Northwestern Pacific (NPFC-2022-TWG CMSA05-WP08).

30. Japan explained the shared package OMutility had several bugs and suggested that the package be re-distributed with these bugs fixed after this meeting.

31. The TWG CMSA noted that the OMutility package developed by Japan cannot be used for BSSPM and encouraged China to calculate the performance measures using its own resources.

6.4 Discussion on the ranking of the candidate stock assessment models

6.5 Selection of the model for chub mackerel stock assessment

32. The TWG CMSA reviewed and revised the table of priority performance measures for evaluating the stock assessment models (Annex D).

33. The TWG CMSA discussed how to conduct the retrospective analysis. For the retrospective analysis, the TWG CMSA agreed to calculate Mohn's Rho using SSB, B, and weighted average F by catch-weight-at-age. The TWG CMSA noted the importance of conducting model diagnostics such as retrospective analysis, while also recognizing the difficulty of interpreting the results of such an analysis conducted in a simulated framework. The TWG CMSA agreed to discuss how much weight should be given to the retrospective analysis results after conducting the analysis and reviewing the results.

34. The TWG CMSA recognized the need to hold further discussions on priority performance measures for evaluating the stock assessment models, including consideration of the following:
(a) Reducing their dimension – which performance measures are correlated or uncorrelated?

(b) How do different performance measures conflict among the models?
(c) How should the relative weight for self-test and cross-test be allocated? (Good performance in self-test is usually of particular importance.)
(d) What situations in particular should be avoided (e.g. large overestimation of F_{MSY})?

6.6 Recommendations and timelines for future work

35. The TWG CMSA drafted a timeline of tasks leading up to the TWG CMSA06 meeting (Annex E).

Agenda Item 7. Development of data for the stock assessment of chub mackerel

7.1 Data inventory (catch, size, abundance indices, etc.) and updates

36. China explained its methodologies for sampling, ALK development, and estimating catch-at-age from the ALK, and presented its updated data for length and age distribution, length-weight relationship, catch-at-age, and number-at-age (NPFC-2022-TWG CMSA05-IP04).

37. The TWG CMSA reviewed and updated the table of data potentially available for stock assessment of chub mackerel (Data availability for CMSA).

7.2 Review of standardized fishery-dependent/independent indices, inter alia, standardized abundance indices from China and Russia

38. Russia presented the standardized CPUE for chub mackerel caught by the Russian pelagic trawl fishery in 2015-2021 (NPFC-2022-TWG CMSA05-WP03). Production and natural factors were used as predictors. To analyze the influence, generalized additive models (GAM) were used. The choice of the best model was made using the Akaike information criterion (AIC) and Bayesian information criterion (BIC). The selected model includes coordinates, day of the year, vessel length, engine power, number of fishing vessels and sea surface temperature (SST). The influence of considered factors on CPUE was interpreted and described.

39. Japan pointed out that the method for filtering data targeting chub mackerel was confounded with the response variable. It suggested Russia explore alternative approaches, such as Biseau 1998.

40. China presented the standardized CPUE for chub mackerel caught by China's lighting purse seine fishery up to 2020 (NPFC-2022-TWG CMSA05-WP09). China conducted CPUE standardizations using generalized linear model (GLM) and GAM. Four groups of independent variables were considered in the CPUE standardization: spatial variables (latitude and longitude), temporal variables (year and month), vessel length and environmental variables

(SST, and chlorophyll-a). Log-CPUE was treated as the dependent variable and its error was assumed to follow a normal distribution in each model. The model selections of GLM and GAM were based on BIC. China recommended using the best GAM model to estimate the standardized CPUE for the chub mackerel fishery.

41. Japan suggested some potential improvements in usage of explanatory variables and extraction of abundance trend to China's CPUE standardization and shared them via correspondence.

42. The TWG CMSA requested China to further improve its CPUE standardization by following the CPUE Standardization Protocol for Chub Mackerel when next updating its CPUE standardization.

7.3 Review of biological parameters

43. Japan gave a presentation on how chub mackerel biological behavior and fishing activity correspond to different months of the year and the pros and cons of different ways of defining the fishing year. Use of a fishing year beginning in July or April would avoid splitting the fishing period, enable the setting of the timing at which fish get older to the beginning of the fishing year, and enable the use of one-year data to calculate weight-at-age. Use of a calendar year would split the fishing period, result in chub mackerel getting older in the middle of the year, and only enable half-year data to be used to calculate weight-at-age.

44. The TWG CMSA noted differences in which part of the year Members collect their length data, which can create issues for jointly calculating catch-at-age and weight-at-age. The TWG CMSA agreed to submit fishery (catch-at-age, weight-at-age, maturity-at-age, if possible) data based on a quarterly calendar at its next meeting.

45. Japan gave a presentation on the density-dependent growth and body condition of chub mackerel in the western North Pacific (NPFC-2022-TWG CMSA05-IP06), based on Kamimura et al. (2021, ICES Journal of Marine Science). There has been an increase in the abundance of chub mackerel in recent years, especially after 2013, leading to a decrease in growth and condition factors. Japan's analysis shows that condition factors are negatively related to the abundance of chub mackerel and that growth rate is positively correlated to condition factors, i.e., more abundance leads to a slower growth rate. At least in quarters 1-3, the density-dependent effect plays a substantial role in the decline in condition factor and growth rate of chub mackerel and continuous biological monitoring is therefore important.

7.4 Observer Program

46. The Science Manager summarized the relevant discussions from the TWG CMSA04 and SC06 meetings and reminded the TWG CMSA that the SC has tasked all its subsidiary bodies, including the TWG CMSA, with reporting the data needs and outlining methods (e.g. human or electronic observers) that could be used to collect the necessary data at SC07.

47. The TWG CMSA noted that Members do not currently report bycatch of non-priority species from their chub mackerel fisheries. In the Convention Area, such species are caught by the Chinese and Russian chub mackerel fisheries and the TWG CMSA requested that the Members provide such information, as well as an overview of its domestic observer program for its chub mackerel fishery, at the next meeting. As for Members' national waters, the TWG CMSA was unsure if these also fall under the scope of the task assigned by the SC and requested clarification from the SC on this point.

48. The TWG CMSA agreed to review data or data description on fisheries bycatch in the chub mackerel fisheries and present these data at the next TWG CMSA, if possible.

7.5 Recommendations for future work

49. Regarding the issue of how to define the fishing year, the invited expert suggested that the TWG CMSA consider structuring the stock assessment data on a year-quarter basis, which would allow models to be built to avoid splitting the fishing period, fit to the variation on monthly catch, and provide catch for each of the recruitment, spawning and settlement periods.

Agenda Item 8. Future projection of chub mackerel

50. The TWG CMSA Vice Chair, Dr. Kazuhiro Oshima (Japan), gave a presentation on the aims of conducting future projections and a table of possible options for the basic specifications for conducting future projections for chub mackerel.

51. The TWG CMSA reviewed and revised the table of options (Annex F). The TWG CMSA agreed to continue to further discuss and refine the options.

Agenda Item 9. Biological reference points

9.1 Candidate biological reference points for chub mackerel

52. The TWG CMSA requested the invited expert to prepare a list of candidate biological reference points for chub mackerel, using the consultancy report *Review of Target and Limit Reference Points* prepared by Laurence Kell as the reference, and to present the list at the next meeting.

53. Japan shared the reference points used in its domestic chub mackerel stock assessment and

explained the procedure used to determine them. The reference points, which were enacted from 2020 and will be updated in 2025, are as follows:

Reference points	Spawning Stock Biomass (10^3 tons)
Target (MSY)	1545
Limit	562
Ban	67

54. The TWG CMSA agreed to hold further discussions of candidate biological reference points for the provision of chub mackerel management advice at its next meeting using the reference points used in the Japanese domestic chub mackerel stock assessment and the list to be prepared by the invited expert as the starting point.

Agenda Item 10. Review of the Work Plan of the TWG CMSA

55. The TWG CMSA reviewed and updated the Work Plan of the TWG CMSA (NPFC-2022-TWG CMSA05-WP02 (Rev. 1)).

Agenda Item 11. Other matters

11.1 Timeline and intersessional activities before TWG CMSA06

56. The timeline and intersessional activities before TWG CMSA06 are as described in Annexes E and G.

57. The TWG CMSA expressed its appreciation for the valuable contributions and support of the invited expert. The invited expert agreed to extend the term of his consultancy through the TWG CMSA06 meeting so that he can continue to support the development of the operating model and testing of stock assessment models.

11.2 Other issues

58. No other issues were discussed.

Agenda Item 12. Recommendations to the Scientific Committee

59. The TWG CMSA agreed:
    (a) To run the models using the latest pseudo data by the 2nd meeting of the SWG OM (12 August) (Annex E).
    (b) To use the revised performance measures for evaluating the stock assessment models in the development of the operating model (Annex D).
    (c) To submit fishery (catch-at-age, weight-at-age, maturity-at-age, if possible) data based

on a quarterly calendar to the next TWG CMSA meeting.

(d) To update and improve the standardized abundance indices and other data for use in the stock assessment as discussed under agenda item 7 and provide standardized abundance indices to the next TWG CMSA meeting.

(e) To hold further discussions of candidate biological reference points for the provision of chub mackerel management advice at its next meeting using the reference points used in the Japanese domestic chub mackerel stock assessment and the list to be prepared by the invited expert as the starting point.

(f) To review data or data description on fisheries bycatch in the chub mackerel fisheries and present these data at the next TWG CMSA, if possible.

60. The TWG CMSA recommended the following to the SC:

(a) The TWG CMSA recommended the Work Plan of the TWG CMSA (NPFC-2022-TWG CMSA05-WP02 (Rev. 1)).

(b) The TWG CMSA requested the SC to provide clarification on whether national waters fall under the scope of the task assigned by the SC to its subsidiary bodies of reporting the data needs and outlining methods that could be used to collect the necessary data.

Agenda Item 13. Adoption of the Report

61. The report was adopted by consensus.

Agenda Item 14. Close of the Meeting

62. The meeting closed at 12:00 pm on 19 May 2022, Tokyo time.

Annexes

Annex A – Agenda

Annex B – List of Documents

Annex C – List of Participants

Annex D – Priority performance measures for evaluating the stock assessment models

Annex E – Timeline of tasks for the Small Working Group on Operating Model and external expert

Annex F – Options for the basic specifications for conducting future projections for chub mackerel

Annex G – Flowchart for the development of operating models and testing stock assessment models

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 4th TWG CMSA and 6th SC meeting
- 3.2 7th Commission meeting
- 3.3 Intersessional meetings of SWG OM

Agenda Item 4. Review of Terms of Reference and Protocols of the TWG CMSA

- 4.1 Terms of Reference
- 4.2 CPUE Standardization Protocol
- 4.3 Stock Assessment Protocol
- 4.4 Protocol for the Operating Model Development

Agenda Item 5. Member's fisheries information and research activities

- 5.1 Description of fisheries, inter alia, fishing seasons and fishing grounds
- 5.2 Research activities

Agenda Item 6. Stock assessment model for chub mackerel

- 6.1 Progress of the intersessional works
- 6.2 Data generation by PopSim as input to the candidate stock assessment models
- 6.3 Report on the performance of the candidate stock assessment models
- 6.4 Discussion on the ranking of the candidate stock assessment models
- 6.5 Selection of the model for chub mackerel stock assessment
- 6.6 Recommendations and timelines for future work

Agenda Item 7. Development of data for the stock assessment of chub mackerel

- 7.1 Data inventory (catch, size, abundance indices, etc.) and updates
- 7.2 Review of standardized fishery-dependent/independent indices, inter alia, standardized abundance indices from China and Russia
- 7.3 Review of biological parameters
- 7.4 Observer Program

7.5 Recommendations for future work

Agenda Item 8. Future projection of chub mackerel

Agenda Item 9. Biological reference points

9.1 Candidate biological reference points for chub mackerel

Agenda Item 10. Review of the Work Plan of the TWG CMSA

Agenda Item 11. Other matters

11.1 Timeline and intersessional activities before TWG CMSA06

11.2 Other issues

Agenda Item 12. Recommendations to the Scientific Committee

Agenda Item 13. Adoption of Report

Agenda Item 14. Close of the Meeting

Annex B

List of Documents

MEETING INFORMATION PAPERS

Symbol	Title
NPFC-2022-TWG CMSA05-MIP01	Meeting Information
NPFC-2022-TWG CMSA05-MIP02	Provisional Agenda
NPFC-2022-TWG CMSA05-MIP03 (Rev. 2)	Annotated Indicative Schedule

REFERENCE DOCUMENTS

Symbol	Title
NPFC-2022-AR-Annual Summary Footprint - Chub&Spotted Mackerels	Annual catch and effort statistics

WORKING PAPERS

Symbol	Title
NPFC-2022-TWG CMSA05-WP01	Summary of the 2nd Meeting of the Small Working Group on Operating Model for Chub Mackerel Stock Assessment
NPFC-2022-TWG CMSA05-WP02	TWG CMSA Work Plan, 2022-2026
NPFC-2022-TWG CMSA05-WP03	Standardized CPUE for Chub mackerel (*Scomber japonicus*) caught by Russian pelagic trawl fishery in 2015-2021
NPFC-2022-TWG CMSA05-WP04	Update stock assessment based on ASAP (age-structured assessment program) for Chub mackerel in the North Pacific Ocean 2022
NPFC-2021-TWG CMSA05-WP05	North Pacific Ocean Chub mackerel Stock Assessment Report Based on BSSPM
NPFC-2021-TWG CMSA05-WP06	Update of Virtual Population Analysis and State-Space Assessment Model for Operating Models of Chub Mackerel Stock Assessment in NPFC
NPFC-2021-TWG CMSA05-WP07	Chub mackerel stock assessment using KAFKA
NPFC-2021-TWG CMSA05-WP08	Fitting VPA and SAM to pseudo data generated from POPSIM: A first analysis for chub mackerel in Northwestern Pacific
NPFC-2021-TWG CMSA05-WP09	Standardized CPUE of Chub mackerel (*Scomber japonicus*) caught by the China's lighting purse seine fishery up to 2020

INFORMATION PAPERS

Symbol	Title
NPFC-2022-TWG CMSA05-IP01	Russian Mackerel fishery in the Northwest Pacific Ocean
NPFC-2022-TWG CMSA05-IP02	Review of chub mackerel fishery in China and research activities
NPFC-2022-TWG CMSA05-IP03	Monthly catch data and the maps and description of China' fishing grounds
NPFC-2022-TWG CMSA05-IP04	Content of the document for data description in China
NPFC-2022-TWG CMSA05-IP05	Fisheries information and research activities JAPAN
NPFC-2022-TWG CMSA05-IP06	Density dependent growth and body condition of chub mackerel in the western North Pacific

Annex C

List of Participants

CHAIR

Vladimir KULIK
vladimir.kulik@tinro-center.ru

CANADA

Janelle CURTIS
Janelle.Curtis@dfo-mpo.gc.ca

Chris ROOPER
Chris.Rooper@dfo-mpo.gc.ca

CHINA

Qiuyun MA
qyma@shou.edu.cn

Heng ZHANG
zhangh1@ecsf.ac.cn

Kai CAI
846977742@qq.com

Libin DAI
644318716@qq.com

Kindong RICHARD
kindong@shou.edu.cn

Yantong MEI
1320229008@qq.com

Yongchuang SHI
1024731143@qq.com

Yufei ZHOU
787715502@qq.com

EUROPEAN UNION

Karolina MOLLA GAZI
karolina.mollagazi@wur.nl

JAPAN

Kazuhiro OSHIMA
oshima_kazuhiro28@fra.go.jp

Shuya NAKATSUKA
nakatsuka_shuya49@fra.go.jp

Takumi FUKUDA
takumi_fukuda720@maff.go.jp

Momoko ICHINOKAWA
ichinokawa_momoko09@fra.go.jp

Akihiro MANABE
manabe_akihiro97@fra.go.jp

Shota NISHIJIMA
nishijima_shota02@fra.go.jp

Sayako TAKEDA
sayako_takeda590@maff.go.jp

Haruo TOMINAGA
haruo_tominaga170@maff.go.jp

Kyutaro YASUMOTO
kyutaro_yasumoto890@maff.go.jp

Ryuji YUKAMI
yukami_ryuji41@fra.go.jp

RUSSIA

Oleg KATUGIN
oleg.katugin@tinro-center.ru

Dmitrii ANTONENKO
dmantonenko@yandex.ru

Emiliya CHERNIENKO
emilya.petrovna@gmail.com

Igor CHERNIENKO
chernienko.igor@gmail.com

SECRETARIAT GUEST

James IANELLI
jim.ianelli@gmail.com

INVITED EXPERT

Joel RICE
ricemarineanalytics@gmail.com

RAPPORTEUR

Alex MEYER
meyer@urbanconnections.jp

SECRETARIAT

Alex ZAVOLOKIN
azavolokin@npfc.int

Yuko YOSHIMURA-TAKAMIYA
ytakamiya@npfc.int

Sungkuk KANG
skang@npfc.int

Annex D

Priority performance measures for evaluating the stock assessment models

			Measure Available				
Measure	**Necessity**	Priority	VPA	ASAP	KAFKA	SAM	BSSPM
State Variables							
B (whole years)	Compulsory	Yes	Yes	Yes	Yes	Yes	Yes
R (whole years)	Compulsory	Yes	Yes	Yes	Yes	Yes	No
F (whole years)	Compulsory	Yes	Yes	Yes	Yes	Yes	No
Exploitation Rate			Yes	Yes	Yes	Yes	Yes
Biological Reference Points							
F%SPR	Compulsory, if possible	Yes	Yes	Yes	Yes	Yes	No
F0.1, FMAX	Compulsory, if possible	Yes	Yes	Yes	Yes	Yes	No
B_{MSY}	Compulsory, if possible	Yes	Yes*	Yes*	Yes*	Yes	Yes
F_{MSY}	Compulsory, if possible	Yes	Yes*	Yes*	Yes*	Yes	Yes
Depletion Statistics							
SSB/max(SSB) (periods**)	Compulsory	TBD	Yes	Yes	Yes	Yes	No
B/max(B) (periods**)	Compulsory	Yes	Yes	Yes	Yes	Yes	Yes
SSB/median(SSB) (periods**)	Compulsory	TBD	Yes	Yes	Yes	Yes	No
B/median(B) (periods**)	Compulsory	Yes	Yes	Yes	Yes	Yes	Yes
***Relevant Time period for Depletion Statistics*	*Average by decade, 1970's-2020.*						

Retrospective analysis (e.g. Mohn's rho) 7 years	Compulsory	Yes	Yes	Yes	Yes	Yes	Yes	

Notes and Questions:

Biological reference points will be calculated by a standardized method.
The time period for the biological reference points is 2017-2019 and 2016-2018.
How to rank or utilize the results in comparison of the performance measures.
Weighted average F by catch-weight-at-age will be used as the performance measure of F (catch-at-age will be based on observed one for VPA and KAFKA and on estimated one for ASAP and SAM).
Check the Monh's rho of SSB B, and the weighted average F.
**by post hoc analysis*

Timeline of tasks for the Small Working Group on Operating Model and external expert

Category	May 2022	June 2022	July 2022	August 2022	5-8 September 2022 (TWG CMSA06)
ASAP		Submit performance measures based on true data by 30 June.		Fit to pseudo data and calculate performance measures. Submit performance measures based on true and pseudo data by the 2nd SWG OM meeting.	
VPA					
SAM					
KAFKA	Answers to the questions from Japan by 31 May.				
BSSPM	Improve by 15 June if needed.				
Generation of pseudo data (PopSim)		By 15 June			
Performance measures (OMutility)		By 15 June			
Scoring and Ranking	How to use the performance measures for scoring and ranking of the candidate stock assessment models.			How to use the performance measures for scoring and ranking of the candidate stock assessment models.	Rank the candidate stock assessment models.

Intersessional SWG **OM meetings**	•30 June Agenda: progress in generating pseudo data, initial check if there are any issues with fitting models and calculating performance measures.	•12 Aug Agenda: TBD

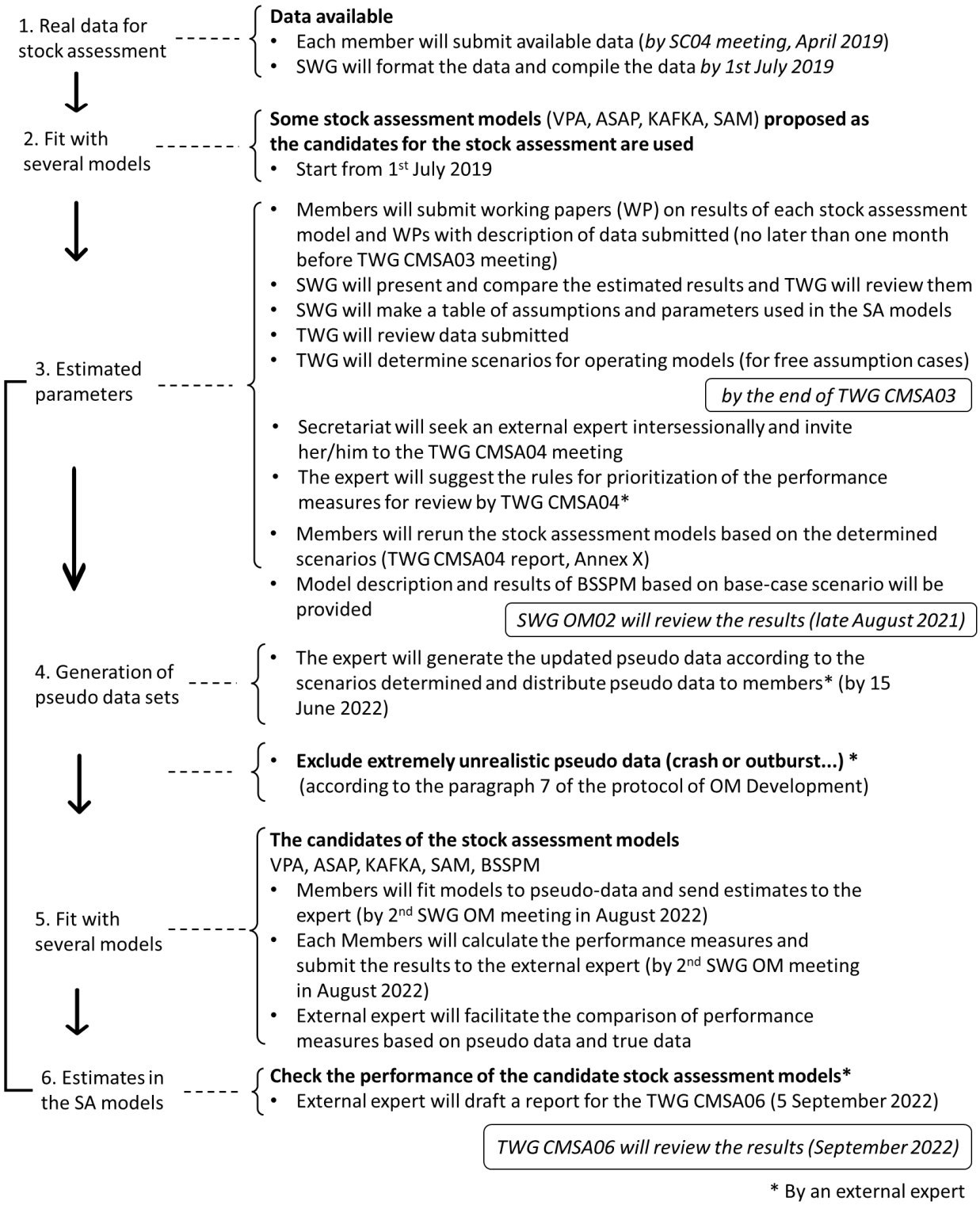
Annex F

Options for the basic specifications for conducting future projections for chub mackerel

Items	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Issue to be clarified**
Type of simulation	Stochastic (how many times?)	Deterministic			Model uncertainty, Management objective
Duration	Short (<5 years)	Medium (5-10 years)	Long (>10 years)	Equilibrium	Ask the Commission to consider management objective and methods. Consider appropriate duration for short-lived species.
Type of uncertainties	Recruitment	Parameter estimates	Other? (management implication etc.)		Model uncertainty, Management method
Recruitment level	Model-based approach using S-R relations (BH/Ricker/HS/Others)	Empirical approach by resampling past recruitments (what duration?)			Model uncertainty
Error structure in recruitment	Parametric (log-normal?)	Non-parametric (resampling of deviations)			

Catch	F-based (Current F/Mean F for reference period)	C-based (What is HCR?)	Other MP?	Include terminal year's F or not	Management Method, HCR
Estimation of catch from terminal year to current year	Terminal year	Last year of harvest	Average of 2 or 3 recent years		

Flowchart for the development of operating models and testing stock assessment models



* By an external expert