



North Pacific Fisheries Commission

NPFC-2019-TWG CMSA02-Final Report

**2nd Meeting of the Technical Working Group
on Chub Mackerel Stock Assessment**

REPORT

28 February-2 March 2019

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North Pacific Fisheries Commission
2nd Meeting of the Technical Working Group on Chub Mackerel Stock
Assessment

28 February-2 March 2019

Yokohama, Japan

REPORT

Agenda Item 1. Opening of the Meeting

1. The 2nd Meeting of the Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA) of the North Pacific Fisheries Commission (NPFC) took place in Yokohama, Japan on 28 February-2 March 2019, and was attended by Members from Canada, China, Japan, and the Russian Federation. The European Union attended as an observer.
2. The meeting was opened by the TWG CMSA Chair, Dr. Oleg Katugin, who outlined the objectives and procedures for the meeting.
3. Japan welcomed the participants to Yokohama, highlighted that chub mackerel is an important species for the NPFC, and expressed the hope that the participants would make good progress towards completing the chub mackerel stock assessment.

Agenda Item 2. Adoption of Agenda

4. The Agenda was adopted without revision (Annex A). The List of Documents and Participants List are attached (Annexes B, C).

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

3.1 3rd SC meeting and 4th Commission meeting

5. The Science Manager explained that the 3rd Scientific Committee (SC) meeting and 4th Commission meeting adopted the recommendations made by the TWG CMSA01.
6. The Science Manager provided an overview of CMM 2018-07 for Chub Mackerel.

3.2 Skype meeting of the SWG OM CMSA and intersessional work

7. The Science Manager provided an overview of the outcomes of the skype meeting of the Small Working Group on Operating Model for Chub Mackerel Stock Assessment (SWG OM CMSA).

8. The Science Manager explained that an informal, face-to-face meeting of the SWG OM CMSA was held and that the outcomes of the meeting would be presented under Agenda Item 7.2.

Agenda Item 4. Review of Member's fisheries and research activities

9. Russia gave a presentation on its fisheries for chub mackerel in 2018 (NPFC-2019-TWG CMSA02-WP05). Russia resumed its chub mackerel fisheries in 2015. Total catch by Russian vessels almost doubled from 2017 to 2018. Russia suggested that this is likely due to the increased abundance of chub mackerel. Russia is collecting size distribution data and found that the dominant length is 30-34 cm.
10. China presented an update on its fishery and research activities (NPFC-2019-TWG CMSA02-IP04). China resumed its chub mackerel fisheries in 2014. From 2015-2018, fishing effort has been stable, with a decrease after 2016. Based on the observation of increasing CPUE in recent years, China suggested that the chub mackerel stock is gradually recovering. China is collecting size and age distribution data, and has found that the dominant length is 19-32 cm and that the age structure of chub mackerel in the high seas is dominant from 1 year to 3 years.
11. Japan presented an update on its fishery and research activities (NPFC-2019-TWG CMSA02-IP05). Japan has been collecting size and age distribution data for its domestic stock assessment since the 1970s, from which it has estimated catch-at-age data. In 2014-2016, fish from the 2013 year-class (a very strong year-class) accounted for most of the catch. In 2017, fish from the 2013 year-class accounted for half of the catch. For abundance indices, Japan is conducting four fisheries-independent surveys (spring/summer/autumn recruitment surveys and year-round egg survey) and one fisheries-dependent survey (dip-net fishery). Based on biological studies, Japan has found that growth of chub mackerel has been reduced since 2014 and that maturity has been delayed since 2013. The reduced growth and delayed maturity rates can be partially explained by a density-dependent effect, but they are likely also affected by other factors.

Agenda Item 5. Review and evaluation of fishery-dependent and fishery-independent data available for stock assessment

5.1 Review of catch data availability and quality

5.2 Review of length and age data availability and quality

12. The participants reviewed and updated catch data availability, and length and age data availability (Annex D).
13. Regarding data quality, the participants agreed to conduct a simple review before starting the

operating model work, and to submit descriptions of their data to and conduct a more thorough review at the next TWG CMSA meeting.

5.3 Data collection templates

14. The participants agreed to defer discussions on the data collection templates until Agenda Item 7, as it would be more appropriate to discuss them after deciding on the type of operating model to be used for the stock assessment.

5.4 Data sharing

15. The participants agreed that discussions on data sharing should be held in conjunction with discussions on the data collection templates, and therefore agreed to defer discussions until Agenda Item 7.

Agenda Item 6. Review and evaluation of fishery-dependent and fishery-independent indices

6.1 Review of the existing CPUE Standardization Protocol

16. The participants reviewed the CPUE Standardization Protocol and determined that no revisions are currently necessary.

6.2 Quality of the indices

17. Japan presented a standardized abundance index for spawning stock biomass of chub mackerel in the Northwest Pacific based on historical monthly egg survey data using a Vector Autoregressive Spatio-Temporal (VAST) model (NPFC-2019-TWG CMSA02-WP03 (Rev. 1)). Japan found that the yearly patterns of its nominal CPUE and the standardized CPUE were similar. It also found that, although the effects of sea-surface temperature (SST) were small, the best model includes the effects of SST. Furthermore, Japan found that estimated egg density is always high along Japan's Pacific coast. Japan considered its approach for standardization to be reasonable, and the diagnostics it has run did not show any serious violation of model assumptions. Japan suggested that one reason for the small effect of SST may be a mismatch between the temporal scales of SST in the model and that of the biological phenomenon. Japan will examine this further.

6.3 Recommendations for future work

18. The participants agreed to use the abundance indices derived from Japan's summer recruitment survey, autumn recruitment survey, and dip-net fishery as candidate indices.
19. Japan explained that the indices from its summer and autumn recruitment surveys are more representative than that from its spring recruitment survey, as the fish in spring are still small and susceptible to instantaneous natural mortality. Japan said that it will explore the possibility

of using the abundance index derived from the spring recruitment survey.

20. The participants agreed to use the abundance index derived from Russia's historical chub mackerel fisheries as a candidate index.
21. The participants agreed to explore the possibility of using an abundance index derived from Russia's resumed chub mackerel fisheries as a candidate index.
22. The participants agreed to explore the possibility of using an abundance index derived from China's chub mackerel fisheries as a candidate index.
23. The participants agreed to explore the possibility of using an abundance index derived from Japan's purse seine fishery as a candidate index. The participants noted the importance of this fishery but also recognized the difficulty of deriving a reliable CPUE from it.

Agenda Item 7. Stock assessment of chub mackerel

24. Japan presented a range of estimates of natural mortality rate (M) for chub mackerel in the North Pacific Ocean (NPFC-2019-TWG CMSA02-WP01 (Rev. 2)). Japan suggested that the median M value of 0.41 be used for the reference case in future stock assessments and for operating models, and that 0.3 and 0.5 be used for sensitivity analysis/robustness tests because most estimates fall in values between 0.3 and 0.5.
25. The TWG CMSA considered the possibility to use three reference cases for natural mortality for operating models: the median value for M , the mean value for M , and age-specific mortality from the working paper presented by Japan (NPFC-2019-TWG CMSA02-WP01 (Rev. 2)).
26. Japan presented a preliminary analysis of state-space stock assessment model (SAM) for the chub mackerel in the Northwest Pacific as an alternative to virtual population analysis (VPA), Japan's longstanding domestic stock assessment model for Pacific chub mackerel (NPFC-2019-TWG CMSA02-WP02). Based on the analysis, Japan proposed using SAM as a candidate stock assessment model for chub mackerel, to be tested using the NPFC's operating model.
27. The participants agreed to Japan's proposal. Taking into account the decision of the TWG CMSA01 meeting, the participants agreed to test the following five stock assessment models using the operating model: a SAM model, a VPA model, an age-structured assessment program (ASAP) model, a cohort analysis with Kalman filter (KAFKA) model, and a state-space production model.

7.1 Review of the existing Stock Assessment Protocol

28. The participants reviewed the Stock Assessment Protocol and determined that no revisions are currently necessary.

7.2 Progress on the development of operating model

29. SWG OM CMSA presented a draft summary of the outcomes of its informal meeting held on 27 February 2019. The SWG reported that it had reviewed some existing models and tools for data simulation (NPFC-2019-TWG CMSA02-IP01 (Rev. 1), 02 and 03) and discussed the structure of the operating model to be used for testing stock assessment models for chub mackerel.

7.2.1 Protocol of the Operating Model Development

30. The participants reviewed the draft Protocol of the Operating Model Development prepared by the SWG OM CMSA (NPFC-2019-TWG CMSA02-WP06) and adopted it (Annex E).

7.2.2 Type(s) of operating model and its performance measures

7.2.3 Framework and structure of operation model

31. The participants agreed to use Population Simulator (PopSim) as the platform for the operating model and drafted a flowchart for the development of the operating model. The flowchart is attached to the TWG CMSA Work Plan.
32. The participants noted that the basic operating model has no spatial structure and agreed that they will consider spatially-structured models as future work.
33. The participants agreed that the operating model has an age-based structure rather than length-based structure according to the availability of the existing data, and that the starting year of operating model is 1970 since age-specific data (e.g., catch-at-age) are available from 1970.

7.2.4 Towards development and conditioning of operating model

34. The participants discussed and compiled a list of possible and compulsory performance measures for evaluating the candidate stock assessment models (Annex F).
35. The participants discussed data required for the operating model. The participants agreed on the list of data to be shared in order to estimate parameters for the operating model using the candidate stock assessment models (Annex G).
36. The participants proposed that the TWG CMSA should seek an external expert to support the development of the operating model and invite him/her to attend the next TWG CMSA meeting.

7.3 Recommendations for future work

37. Recommendations for future work are as described in the flowchart for the development of the operating model and the updated TWG CMSA Work Plan (Annex H).

Agenda Item 8. Review of the Terms of Reference and Work Plan of the TWG CMSA

38. The participants reviewed the Terms of Reference and determined that no revisions are currently necessary.

39. The participants reviewed and updated the Work Plan of the TWG CMSA (Annex H).

Agenda Item 9. Other matters

9.1 Observer Program

40. The Science Manager provided an overview of the plans to establish an NPFC Observer Program and explained that it could collect scientific data needed for the chub mackerel stock assessment. The participants agreed to discuss which scientific data should be collected by the NPFC Observer Program for chub mackerel at the next TWG CMSA meeting, when data requirements will be clearer.

9.2 Selection of TWG CMSA Chair

41. The participants agreed to extend the term of the current Chair, Dr. Oleg Katugin, for two more years.

9.3 Next TWG CMSA meeting

42. The TWG CMSA proposed that the next TWG CMSA meeting should be held at the end of 2019 or in early 2020, and if necessary SWG OM CMSA will meet informally prior to TWG CMSA03.

9.4 Other matters

43. No other matters were discussed.

Agenda Item 10. Recommendations to the Scientific Committee

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

- (a) The TWG CMSA agreed to use abundance indices derived from Japan's summer recruitment survey, autumn recruitment survey, and dip-net fishery, as well as Russia's historical chub mackerel fisheries as candidate indices.
- (b) The TWG CMSA agreed to explore the possibility of using abundance indices derived

from Japan's spring recruitment survey, Russia's resumed chub mackerel fisheries, China's chub mackerel fisheries, and Japan's purse seine fishery as candidate indices.

- (c) The TWG CMSA agreed to further discuss using three reference cases for natural mortality for operating models: the median value for M, the mean value for M, and age-specific mortality from NPFC-2019-TWG CMSA02-WP01 (Rev. 2).
- (d) The TWG CMSA agreed to test the following five stock assessment models using the operating model: a SAM model, a VPA model, an ASAP model, a KAFKA model, and a state-space production model.
- (e) The TWG CMSA recommended that the SC endorse the Protocol of the Operating Model Development (Annex E).
- (f) The TWG CMSA agreed to use PopSim as the platform for the operating model.
- (g) The TWG CMSA agreed that the basic operating model has no spatial structure and agreed to consider spatially-structured models as future work.
- (h) The TWG CMSA agreed that the operating model has an age-based structure rather than length-based structure according to the availability of the existing data, and that the starting year of operating model is 1970.
- (i) The TWG CMSA agreed on the list of possible and compulsory performance measures for evaluating the candidate stock assessment models (Annex F).
- (j) The TWG CMSA agreed to share data to estimate parameters for the operating model using the candidate stock assessment models (Annex G).
- (k) The TWG CMSA recommended that the SC endorse the TWG CMSA's proposal of seeking an external expert to support the development of the operating model and inviting him/her to attend the next TWG CMSA meeting.
- (l) The TWG CMSA recommended that the SC endorse the updated TWG CMSA Work Plan (Annex H).
- (m) The TWG CMSA agreed to extend the term of the current Chair, Dr. Oleg Katugin, for two more years.
- (n) The TWG CMSA recommended that the next TWG CMSA meeting should be held at the end of 2019 or in early 2020, and if necessary SWG OM CMSA will meet informally prior to TWG CMSA03.

Agenda Item 11. Adoption of the Report

45. The report was adopted by consensus.

Agenda Item 12. Close of the Meeting

46. The meeting closed at 17:22 on 2 March 2019.

Annexes:

Annex A – Agenda

Annex B – List of Documents

Annex C – List of Participants

Annex D – Potentially available data for chub mackerel stock assessment

Annex E – Protocol of the Operating Model Development

Annex F – Performance measures for evaluating stock assessment models

Annex G – Data requirements for candidate stock assessment models and available data to be shared to estimate parameters for the operating model using the stock assessment models

Annex H – TWG CMSA Work Plan, 2017-2021

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List of Documents

MEETING INFORMATION PAPERS

Document number	Title
NPFC-2019-TWG CMSA02-MIP01 (Rev. 2)	Meeting Notice and Information
NPFC-2019-TWG CMSA02-MIP02	Provisional Agenda
NPFC-2019-TWG CMSA02-MIP03	Provisional Annotated Agenda
NPFC-2019-TWG CMSA02-MIP04 (Rev. 1)	Indicative Schedule

REFERENCE DOCUMENTS

Document number	Title
CMM 2018-07	CMM for Chub Mackerel
NPFC-2018-SC03-Final Report	Report of the 3rd SC meeting
NPFC-2018-COM04-Final Report	Report of the 4th Commission meeting
	Terms of Reference for TWG CMSA
	Stock Assessment Protocol for Chub Mackerel
	Data availability for CMSA
	Interim Guidance for Management of Scientific Data
	CPUE Standardization Protocol for Chub Mackerel

WORKING PAPERS

Document number	Title
NPFC-2019-TWG CMSA02-WP01 (Rev. 2)	A Range of Estimates of Natural Mortality Rate for Chub Mackerel in the North Pacific Ocean
NPFC-2019-TWG CMSA02-WP02	Preliminary analysis of state-space stock assessment model for the chub mackerel in the Northwest Pacific
NPFC-2019-TWG CMSA02-WP03 (Rev. 1)	Standardizing abundance index for spawning stock biomass of chub mackerel in the Northwest Pacific
NPFC-2019-TWG CMSA02-WP04	TWG CMSA Work Plan, 2017-2021
NPFC-2019-TWG CMSA02-WP05	Russian fisheries for chub mackerel in 2018
NPFC-2019-TWG CMSA02-WP06	Draft Protocol of the Operating Model Development

INFORMATION PAPERS

Document number	Title
NPFC-2019-TWG CMSA02-IP01 (Rev. 1)	Introduction of the paper "Simulation testing the robustness of stock assessment models to error: some results from the ICES strategic initiative on stock assessment methods"
NPFC-2019-TWG CMSA02-IP02	Population simulator (PopSim)
NPFC-2019-TWG CMSA02-IP03	Materials for flowchart of operating model for CMSA
NPFC-2019-TWG CMSA02-IP04	Review of chub mackerel fishery in China and research activities
NPFC-2019-TWG CMSA02-IP05	Review of Member's fisheries and research activities by Japan

List of Participants

CHAIR

Oleg KATUGIN
Pacific Branch of the Federal Scientific
Research Institute of Fisheries and
Oceanography
okatugin@mail.ru

Lianyong FANG
China Overseas Fisheries Association
admin1@tuna.org.cn

Qiuyun MA
Shanghai Ocean University
qyma@shou.edu.cn

CANADA

Chris ROOPER
Fisheries and Oceans Canada
chris.rooper@dfo-mpo.gc.ca

Luoliang XU
Shanghai Ocean University
xlxxlx@yeah.net

Heng ZHANG
East China Sea Fisheries Research Institute,
Chinese Academy of Fishery Sciences
zhangh1@ecsf.ac.cn

CHINA

Siquan TIAN
Shanghai Ocean University
sqtian@shou.edu.cn

Bai LI
Shanghai Ocean University
bai.li@maine.edu

Jie CAO
Shanghai Ocean University
jcao22@ncsu.edu

Tianfei CHENG
East China Sea Fisheries Research Institute,
Chinese Academy of Fishery Sciences
chengtf@ecsf.ac.cn

JAPAN

Hideki NAKANO
National Research Institute of Fisheries
Science
hnakano@affrc.go.jp
+81543366032

Momoko ICHINOKAWA
National Research Institute of Fisheries
Science
ichimomo@fra.affrc.go.jp
+81457887645

Chikako WATANABE
National Research Institute of Fisheries
Science
falconer@affrc.go.jp

Taiki FUJI
National Research Institute of Fisheries
Science
tfuji114@affrc.go.jp

Yuki KANAMORI
National Research Institute of Fisheries
Science
kana.yuki@fra.affrc.go.jp

Shin-Ichiro NAKAYAMA
National Research Institute of Fisheries
Science
shin.ichiro.nak@gmail.com

Hiroshi NISHIDA
National Research Institute of Fisheries
Science
hnishi@fra.affrc.go.jp
+81457887632

Shota NISHIJIMA
National Research Institute of Fisheries
Science
nishijimash@affrc.go.jp

Hiroshi OKAMURA
National Research Institute of Fisheries
Science
okamura@fra.affrc.go.jp
+81457887645

Kazuhiro OSHIMA
National Research Institute of Fisheries
Science
oshimaka@affrc.go.jp
+81457887516

Norio TAKAHASHI
National Research Institute of Fisheries
Science
norio@affrc.go.jp

Takaaki UMEDA
Fisheries Agency of Japan
takaaki_umeda470@maff.go.jp

RUSSIA

Alexander MIKHEYEV
Pacific Branch of the Federal Scientific
Research Institute of Fisheries and
Oceanography
alex_mikheyev@mail.ru
+79146414763

Dmitrii ANTONENKO
Pacific Branch of the Federal Scientific
Research Institute of Fisheries and
Oceanography
dmantonenko@yandex.ru
+79146978130

OBSERVERS

European Union
Karolina MOLLA GAZI
Wageningen Marine Research
karolina.mollagazi@wur.nl

NPFC SECRETARIAT

Dae-Yeon MOON
Executive Secretary
dymoon@npfc.int
+81354798717

Aleksandr ZAVOLOKIN
Science Manager
azavolokin@npfc.int
+81354798717

Mervin OGAWA
Data Coordinator
mogawa@npfc.int
+81354798717

Aleksandra TEMNYKH
Consultant-Science
aleksandra@npfc.int
+81354798717

Alexander MEYER
Rapporteur
meyer@urbanconnections.jp
+81364325691

Potentially available data for chub mackerel stock assessment

(developed by TWG CMSA in Dec 2017, adopted by SC03 in Apr 2018, updated in Mar 2019)

The members of the Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA) developed and endorsed a template for the potentially available data for stock assessment of chub mackerel at the TWG CMSA meeting in December 2017 (Annex E, TWG CMSA01 Report). The table below lists available data by Japan, Russia and China.

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: 1950-2017, other reports: 1970-2018	Coverage=100%	The chub mackerel catches are estimated from chub and spotted mackerel catches based on port sampling data for purse seine and set net fisheries
Dip net fishery				
Set net				
Size composition data				
Length measurements	Port sampling by 17 local fishery institutes in 17 prefectures	1970-2018	20,000-120,000 (average 40,000) fish/year (ca. 100 measurements per sampling)	Data coverage review
Aging	Port sampling by 17 local fishery institutes in 17 prefectures	1970-2018	500-1000 fish/year	Data coverage review
Catch at age (CAA)	Estimate CAA from the above data	1970-2018	Age-length keys are created approximately	Evaluate uncertainty of catch at age, especially on

			by quarter and local regions	changes of growth depending on recruitment abundance
Abundance indices (survey)				
Spring survey for recruitment	Mainly for sardine and chub mackerel, mid-water trawl	1995-2018	30-60 stations/year	Review survey protocol and conduct standardization
Summer survey for recruitment	Mainly for saury, mid-water trawl	2001-2018	60-80 stations/year	
Autumn survey for recruitment	Mainly for sardine and chub mackerel, mid-water trawl	1995-2018	30-60 stations/year	
Year-round for egg density	Almost all local fishery institutes join this survey program. NORPAC net. Not only for chub mackerel.	1978-2018 (2005-, species identification between chub and spotted mackerel)	ca. 6000 stations in total, 1000-4000 stations with chub mackerel eggs/year	
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)	2003-2018	10-100/year	Standardization, recently fishing efforts between Kanagawa and Shizuoka have changed, reliability??
RUSSIA				
Catch statistics				
Purse seine fishery	Official statistics, reports from fisheries associations	Official statistics:	Coverage 1980-2003 ?%;	Data coverage details to be reviewed

Pelagic trawl fishery		1980-2003, 2004-2018, 1994-2011 (no data available); publications: 1970-2018	Coverage 2004-2018 =100%	
Size composition data				
Length measurements	Sampling from commercial fishing vessels.	2016-2018	1,000-10,000 fish/year (ca. 100 measurements per sampling)	Data coverage details to be reviewed
	Sampling during research surveys.	2010-2018		
Aging	Sampling during research surveys and from commercial fishing vessels	2016-2018	300-500 fish/year	Details to be reviewed
Catch at age (CAA)	Estimate CAA from the above data	2016-2018	Age-length keys are to be developed	Evaluate 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	2010-2018 (June-July)	60-80 stations/year	Changes in abundance and migration patterns; development survey protocol and conduct standardization
		2015-2018 (July-August)	60-80 stations/year	
CHINA				
Catch statistics				

Purse seine fishery	Official statistics, reports from annual report	Official statistics: 2014-2018	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: 2014-2017	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.	2016-2018	550-800 fish/year	Details to be reviewed
Length measurements	Purse seine vessel sampling from commercial vessel	2016-2017	530-1050 fish/year	Details to be reviewed
Aging	Sampling during research surveys and from commercial fishing vessels	2017-2018	30-180 fish/year	Details to be reviewed
Abundance indices (commercial)				
Purse seine fishery	Purse seine logbook	2014-2017	10-60/year	Will conduct standardization

Protocol of the Operating Model Development

This Protocol of the Operating Model Development was drafted by the Small Working Group on Operating Model for Chub Mackerel Stock Assessment (SWG OM CMSA) and adopted at the 2nd meeting of the TWG CMSA in March 2019.

1. Review the existing literatures to examine what types of operating models have been used over the world for simulation data, used in stock assessment models and for comparing performance of different stock assessment models.
2. Review the existing operating models that have been developed for mackerel in the other Regional Fisheries Management Organizations.
3. Review the stock information of chub mackerel in the North Pacific Ocean, including life history traits (e.g. reproduction biology), stock distribution, stock structure, main management units, and environment in relation to the species and the fishery.
4. Determine the temporal and spatial scale of the operating model.
5. Determine the basic structure of operating model (deterministic processes without stochasticity).
 - a. Biological processes such as recruitment, growth, maturation, and natural mortality.
 - b. Fishing processes such as fishing effort, catchability, selectivity, and fishing mortality.
 - c. Observation processes generating observation data, such as total catch, catch-, weight-, and maturity-at age, and abundance indices (CPUE), for the use of each stock assessment model.
6. Specify the structure of stochastic uncertainty on the above processes, parameters and assumptions for the operating model.
7. Measure the performance of simulated data from the operating model.
8. Determine the methods and data used for comparison, selection and processing of results of candidate stock assessment models.
9. Summarize the operating model with a flowchart.

Performance measures for evaluating stock assessment models

Measure	Necessity	Statistics				
<i>State Variables</i>						
B (whole years)	compulsory	median	mean	SE	%bias	RMSE
SSB (whole years)	if possible	median	mean	SE	%bias	RMSE
R (whole years)	if possible	median	mean	SE	%bias	RMSE
F (whole years)	if possible	median	mean	SE	%bias	RMSE
Selectivity at age (whole years)	if possible	median	mean	SE	%bias	RMSE
<i>Basic Biological Parameters</i>						
B0	if possible	median	mean	SE	%bias	RMSE
steepness	if possible	median	mean	SE	%bias	RMSE
<i>Biological Reference Points</i>						
Bmsy (periods?)	if possible	median	mean	SE	%bias	RMSE
SBmsy (periods?)	if possible	median	mean	SE	%bias	RMSE
Fmsy (periods?)	if possible	median	mean	SE	%bias	RMSE
<i>Depletion Statistics</i>						
SSB/max(SSB) (periods?)	if possible	median	mean	SE	%bias	RMSE
SSB/SSB0 (periods?)	if possible	median	mean	SE	%bias	RMSE
SSB/SSBmsy (periods?)	if possible	median	mean	SE	%bias	RMSE
<i>Other Statistics</i>						
B/max(B) (periods?)	if possible	median	mean	SE	%bias	RMSE
B/B0 (periods?)	if possible	median	mean	SE	%bias	RMSE
B/Bmsy (periods?)	if possible	median	mean	SE	%bias	RMSE
<i>Exploitation</i>						
F/Fmsy (periods?)	if possible	median	mean	SE	%bias	RMSE
<i>Exploitation rate</i>						
Exploitation rate (catch/total biomass)	compulsory	median	mean	SE	%bias	RMSE
<i>Retrospective analysis</i>						
Retrospective analysis	if possible					

Data requirements for candidate stock assessment models and available data to be shared to estimate parameters for the operating model using the stock assessment models

	Data requirements					Data available for sharing		
	VPA	SAM	KAFKA	ASAP	Production model	Japan	China	Russia
<u>Catch Statistics</u>								
Total catch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Catch-at-age	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Discard-at-age (if discard occurs for chub mackerel)				If possible		No	No	No
Selectivity by fleet				If possible				
<u>Biological Parameters</u>								
Weight-at-age	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Maturity-at-age	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Natural mortality-at-age	Yes	Yes	Yes	Yes		Yes	No	Yes
<u>Abundance Index</u>								
Recruitment index (survey)	Yes	Yes	Yes	Yes		Yes	No	No
SSB index (including egg survey)	Yes	Yes	Yes	If possible	Yes	Yes	No	No
CPUE index-at-age				Yes		No	No	No
CPUE index (commercial)				Yes	Yes	?	Yes	Yes
Catchability						No		
<u>Observations</u>								
<i>Fishing</i>								

CPUE (all periods, fleets, gears if possible)			Yes	If possible		No	Yes	Yes
<i>Survey</i>								
Stock estimates from survey			Yes	If possible		No	No	Yes?

TWG CMSA Work Plan, 2017-2021

CHUB MACKEREL

Year	Tasks	Progress/Comment	Meeting/Activity
2017	<p>Review of Members' national research on stock status and fisheries</p> <p>Establishment of TWG CMSA</p> <p>Development of TORs, Work Plan and Data List</p>	<p>Done</p> <p>Done/Adopted by the Commission</p> <p>TORs are done. Work Plan and Data List are reviewed on the annual basis.</p>	<p>Chub mackerel workshop, 16-17 Feb</p> <p>SC02 meeting (proposal), COM03 meeting</p> <p>Proposal at the 3rd Commission meeting; Intersessional work on the TORs; TWG CMSA meeting, 4-5 Dec</p>
2018	<p>Report outputs by TWG CMSA01</p> <p>Discussion of the framework for the operating model (OM), list of data required for stock assessment (SA)</p>	<p>Protocol of Operating Model Development has been drafted. Some existing models and tools for data simulation have been reviewed.</p>	<p>SC03 meeting, COM04 meeting;</p> <p>Intersessional work and informal meeting of SWG OM on 27 Feb 2019</p>
2019	<p>Present results of the intersessional work on the OM and organize the OM structure/ proposal of SA model candidates/ agreement on the platform of OM (PopSim)</p> <p>Present outputs by TWG to SC</p> <p>Data preparation and data sharing for OM; development and conditioning of OM</p> <p>Describe and review all data for OM/ Show the results of conditioning OM / Setting OM scenarios</p>	<p>Done.</p>	<p>TWG CMSA02, Mar 2019.</p> <p>SC04 meeting, COM05 meeting;</p> <p>Intersessional</p> <p>TWG CMSA03</p>

2020	<p>Generate pseudo data to be fitted to the stock assessment models</p> <p>Present outputs by TWG to SC</p> <p>Compare stock assessment model candidates and choose the best SA model(s) / finalize the data used for the stock assessment /do preliminary assessment and recommendations to the SC</p>		<p>Intersessional</p> <p>SC05 meeting, COM06 meeting;</p> <p>TWG CMSA04</p>
2021	<p>Present outputs by TWG to SC and provide preliminary recommendations</p> <p>Complete stock assessment with the selected SA model(s) and provide recommendations to SC</p>		<p>SC06 meeting, COM07 meeting;</p> <p>TWG CMSA05</p>

Detailed work plan for the operating model development [to be replaced by the flowchart for OM development]

2018

1. Identification of all available data
2. Specification of objectives and determination of performance measures
3. Discussion of the framework for the operating model (OM)
 - a. Draft a protocol for the OM development
 - b. Specification of model structure
 - i. Important biological processes to be incorporated into the OM
 - ii. Specification of uncertainties to be incorporated in the OM
 - iii. Population dynamics model/data-generating model
 - iv. Determine the population and fishing constant (mortality, fertility, growth, maturation, catchability)
 - v. The method for conditioning the data (what parameters are estimated or not?; what data are used for conditioning?)
 - vi. Develop a flowchart for OM
4. Present the progress and organize the structure of the OMs [TWG CMSA02]
5. Identification and collection of required data [TWG CMSA02]

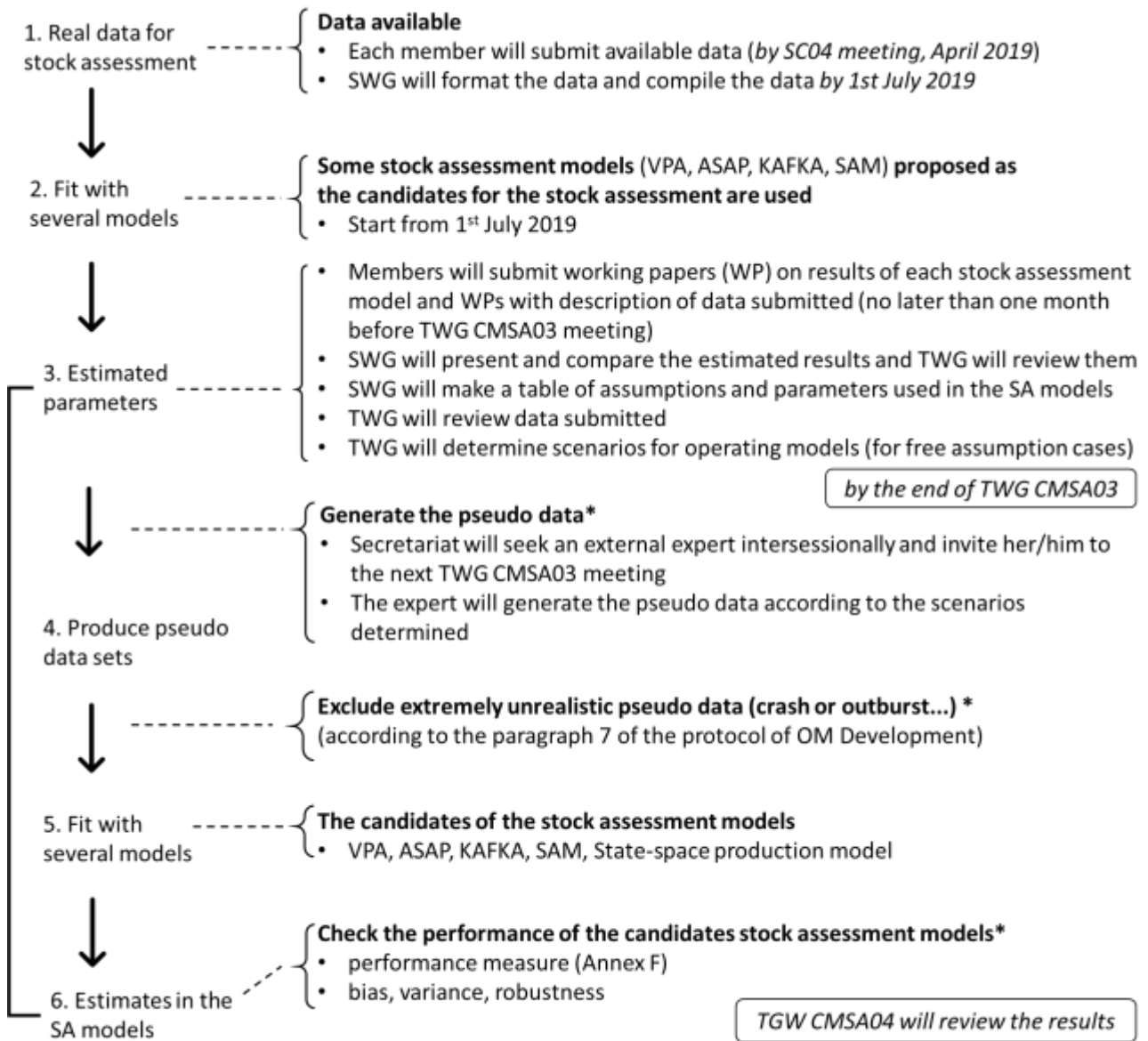
2019

6. Conditioning the OMs on data [intersessional]
7. Presents and compares the results of conditioning [TWG CMSA03]
8. Setting of scenarios of OMs (reference case(s) and sensitivity case(s)) [TWG CMSA03]

2020-2021

9. Generate the pseudo data to be fitted to the stock assessment models
10. Compare stock assessment model candidates according to the pre-determined performance measures and choose the best SA model from the candidates [TWGCMSA04]
11. Evaluate the quality of data and finalize the data used for the stock assessment [TWG CMSA04]
12. Complete stock assessment with the selected SA model(s) and management advice [TGWCMMSA05]

Flowchart for the development of the operating model



* By an external expert