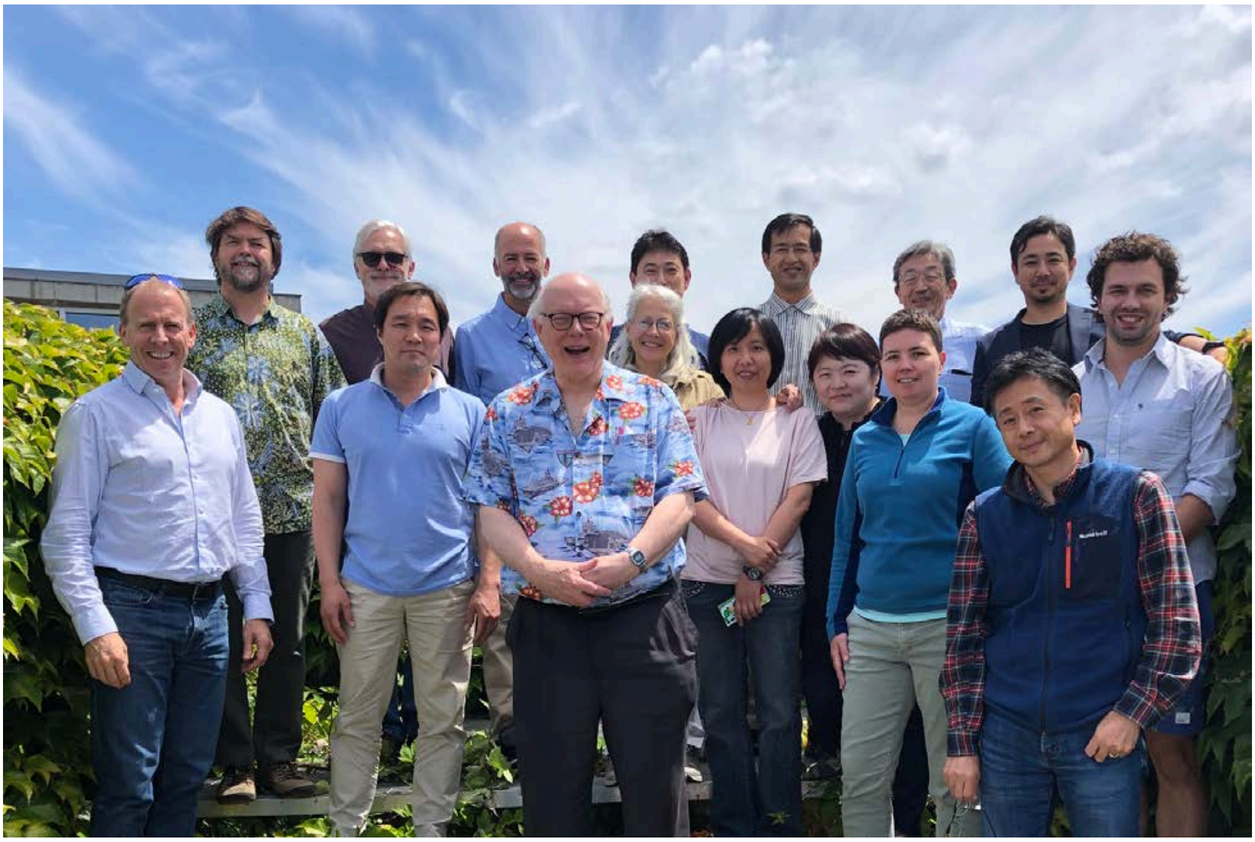
Commission for the Conservation of Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the Tenth Operating Model and Management Procedure Technical Meeting



24 - 28 June 2019

Seattle, USA

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Opening

1. The Chair of the Tenth Operating Model and Management Procedure Technical Meeting (OMMP10), Dr. Ana Parma, opened the meeting and welcomed participants (**Attachment 1**). The Chair noted that the terms of reference are to review the reconditioning of the operating models (OMs) and performance of updated versions of Candidate Management Procedures (CMPs) to develop a limited set to put forward to the Extended Scientific Committee (ESC).
2. The draft agenda was discussed and amended, and the adopted agenda is shown in **Attachment 2**.
3. The list of documents for the meeting is shown at **Attachment 3**.
4. Rapporteurs were appointed and agreed to co-ordinate the preparation of the report along with the consultant and Advisory Panel members. Subsequent report sections are based on the adopted agenda.

Agenda Item 1. Review workplan schedule and progress to date

5. The Chair reviewed the workplan for the development of a new management procedure (MP) and noted that the aim of the workplan is to complete evaluations so that the Extended Commission may consider candidates and adopt an MP in 2019. The adopted MP would be used in 2020 to determine the catch limits for the period 2021-2023.
6. Member scientists were able to update the OM by adding two more years of data (2017 and 2018) to the database used in the stock assessment conducted in 2017. This was completed in June leaving developers very little time to complete all the runs that had been specified by the ESC before the OMMP10. Priority was given to the base runs and a few of the robustness tests considered most influential. Further runs were completed during the OMMP10 and the results are reported under Agenda Item 3.

Agenda Item 2. Operating model and data inputs

2.1 Gene tagging

7. CSIRO presented paper CCSBT-OMMP/1906/06, an update on the gene tagging program. Work to refine the length classes used to identify 2 year-olds (at time of tagging) and 3 year-olds (at time of harvest) was described and will be presented more fully at the ESC in September 2019. The work resulted a more restricted length range being used to determine 2 year old fish, with a consequent reduction in the number of releases used in analysis. Abundance estimates of 2 year-old fish in 2016 and 2017 were revised slightly downwards with small increases in associated CVs. The revised 2016 and 2017 estimates have been provided to the 2019 CCSBT scientific data exchange and have been incorporated in to the final OM conditioning (reported in CCSBT-OMMP/1906/04, see agenda item 2.5).

8. The group discussed the revisions and more general considerations related to the use of gene tagging, including potential biases and the inflation of the CV that might be caused by sampling selectivity, mixing of 2 and 3 year-old fish on the fishing grounds, whether the GAB provides a representative sample of three year old fish, and whether there is any release mortality for sampled fish. It was noted that a number of these issues had been addressed in the gene-tagging design study (CCSBT-ESC/1509/18) and that the inclusion of the more flexible beta-binomial distribution in the OMs would allow for estimation of potential sources of process error as the time series accumulated. The group agreed that many of these issues might be considered in the major stock assessment work scheduled for 2020 and that some could potentially be considered in the robustness testing of future management procedures.

9. On the specific issue of whether the GAB is representative of 3 year olds, Australia commented that half sibling pair (HSP) data from close-kin mark recapture (CKMR) work provides a way to monitor this in the future; all evidence to date suggests the assumption is reasonable (CCSBT-ESC/1809/19; CCSBT-ESC/1809/14).

2.2 Close-kin: POPs and half-sibling indices

10. CSIRO presented paper CCSBT-OMMP/1906/07, a brief note on the close-kin analysis for 2019 as relevant to the group. More details will be provided to the ESC in September 2019, including on improved processes for “genotype calling”. The key inputs for OM conditioning are the updated POP (n=82) and HSP (n=167) data for 2018 and the revision of the estimated false negative rate for HSP identification (0.16). By being cautious in the identification of HSPs, the true number of HSP pairs might be underestimated by 16%. The OM conditioning (see agenda item 2.5) has incorporated this estimate and it is also used in the CKMR abundance estimation model (CCSBT-ESC/1809/14).

11. CCSBT-OMMP/1906/07 notes that although the total number of POPs is substantial, there are rather few corresponding to recent juvenile cohorts (only 5 where the juvenile was born in the 2012-2014 period) and that there is thus not much direct information about the adult stock size in recent years. Furthermore, as the adult stock continues to rebuild, there will be even fewer “POPs per cohort per comparison” in future. Consequently, it may be necessary to increase annual sample sizes in order to maintain robust and up-to-date information on adult stock size. The MP-testing process using the updated OMs is a way to explore what sample sizes might be appropriate in future. The group noted that this could be an issue for consideration in the Research Plan to be discussed at the ESC in September 2019.

2.3 CPUE

12. Japan presented CCSBT-OMMP/1906/08. The paper is the update document for the analysis of the change of the operation pattern of Japanese longline fishing in the most recent year obtained by comparison to the past 10 years. No substantial change was found in the 2018 operational pattern in terms of catch amount, the number of vessels, time and area operated, proportion by area, length frequency, and concentration of operations. The author concluded that the CPUE for the 2018 Japanese longline fishery can be regarded as reflecting stock abundance in the same way as in previous years. The increase in CPUE had contributed the most to the increase in the catch made in 2018; the expansion of the time and space of operation and the number of operations contributed to a lesser extent.

13. CCSBT-OMMP/1906/09 was also presented. This paper summarises the core vessel CPUE which is an abundance index for SBT used as major input to the CMPs. The paper explained data preparation, CPUE standardisation using GLM and area weighting. The data were updated up to 2018. The index values for 2018, reflected by W0.8 and W0.5 evaluated using the base GLM model, are higher than the average over the past 10 years.

14. The authors investigated sources for the large increase in the constant squares (CS) CPUE estimate for 2018, including the “core” vessels compared to alternative fleet subsets, the impact of bycatch of other tunas (in the data), and including area (in different ways in the GLM standardisation, e.g., latitudinal band, and interactions). They found that for the CS CPUE series, the increase could be attributed to area factors, specifically the area 8 band at 40 degrees S latitude. This led to an extended discussion about the characteristics of the fleet and the fishing conditions in 2018. Given the large jump in both the W0.8 and W0.5 CS- variable squares (VS) index values, the group was interested in seeing how these two alternatives compared both in current SSB/CPUE estimates and under, e.g., constant catch projection scenarios. In reviewing some robustness tests under agenda item 3, which only used the VS CPUE series (i.e. the robustness run CPUEw0), the impact of down-weighting the CS model-based estimates was examined. The group recommended that a thorough investigation of CPUE analyses be a focus for the 2020 stock assessment, at which time the specific issue of the high CS estimate for 2018 might also be investigated more fully.

2.4 Small fish in the Indonesian catch

15. Australia reported that after the recent maturity workshop in Bali, Australian and Indonesian scientists had discussed this issue, specifically about getting data to disaggregate Indonesian catches in areas 1 and 2. It reported that updated data were provided to the data exchange for the years 2016-2018, but earlier years had yet to be addressed and that it understood an analysis might be presented at ESC in 2019. It was noted that the disaggregation was not expected to be as clear-cut as originally hoped for in terms of the delineation of mature and immature fish by area.

16. It is anticipated that further data will be available for the 2020 stock assessment.

2.5 Reconditioning of OM

17. Australia presented two papers: i) CCSBT-OMMP/1906/04, on changes to the OM conditioning code, including diagnostic plots of fits to the new gene tagging data; and ii) CCSBT-OMMP/1906/05, on CMP performance but also containing further information on the reconditioned grid and the reconditioned fits to a wider set of data. The OM has now been reconditioned for data up to and including 2018 as well as the first inclusion of the two gene tagging data points.

18. The base grid agreed at the 2017 ESC was used (Table 1).

Table 1. Reference set of OM for the base18 for CMP testing.

Parameter	Value	Cumul N	Prior	Sampling
h	0.60,0.70,0.8	3	uniform	Prior
M_0	0.35,0.4,0.45,0.5	12	Uniform	ObjFn
M_{10}	0.05,0.085,0.12	36	Uniform	ObjFn
W	1	36	Uniform	Prior
CPUE	w0.5, w0.8	72	Uniform	Prior
CPUE age range	4-18,8-12	144	0.67,0.33	Prior
Psi	1.5,1.75,2.0	432	0.25,0.5,0.25	Prior
UAM1	Described below	432		

19. The ESC had also agreed to include the UAM1 scenario in the reference set for the purposes of MP-testing (this is labelled base18 in this report), to account for uncertainty in total catches. This is as agreed in 2016 with respect to discussion of the "MP approach". The "added-catch" (UAM1) scenario is currently implemented as unaccounted catch increasing linearly from 0 to 1,000 t over the period 1990 to 2013 and constant at 1,000 t for 2014-2018 for smaller fish and larger fish. These unaccounted mortalities were added to those already included in the reference set (e.g., 20% for the surface fishery). For future projections, the added catch was to remain at the same proportion of the TAC as in 2016. The unaccounted mortalities are assigned to the fisheries to whose size distributions there is the closest match (fishery 1 and 4 in the projection model). It should be understood that these fisheries may not be the source of the unaccounted mortality; rather this is an expedient way to implement the scenario.

20. Given that unaccounted mortalities are included in the historical catches used for conditioning the OM, the 306 t decided by the Extended Commission to be deducted from the TAC for 2018-2020 was considered to be accounted for within this UAM1 scenario and was not included in the catch/TAC for 2018-2020.

21. A preliminary analysis of the influence of the 2016 aerial survey index (i.e. 2013 recruitment) in the updated OMs was conducted by comparing the recruitment series and fits to abundance indices from the base18 with those from the AS2016 robustness test. Figure 1 indicates that even with the 2016 survey point excluded (recruitment_AS2016) both 2013 and 2014 are substantially larger than average year-classes. The inclusion of the AS2016 data accentuates the strength of these cohorts, especially for the for the 2013 year-class.

22. The fits to the CPUE for the AS2016 grid (Figure 2) still show a substantial upturn in the recent CPUE and a good fit to the 2018 data point in the absence of the very high 2013 year class related to AS2016. The aerial survey index fits are similar (Figure 3) and the GT fits improved in the AS2016 case because the strength of the effect of the recruitment prior discussed in CCSBT-OMMP-1906/05 is much weaker, given that 2013 and 2014 deviates are estimated to be smaller with 2016 aerial survey index removed (Figure 4). The meeting concluded that the exceptionally high 2013 cohort observed in the 2016 AS is not required to explain the recent positive trend in CPUE and in 2018 in particular. The inclusion of the AS2016 data does improve the fit to the 2018 CPUE data point.

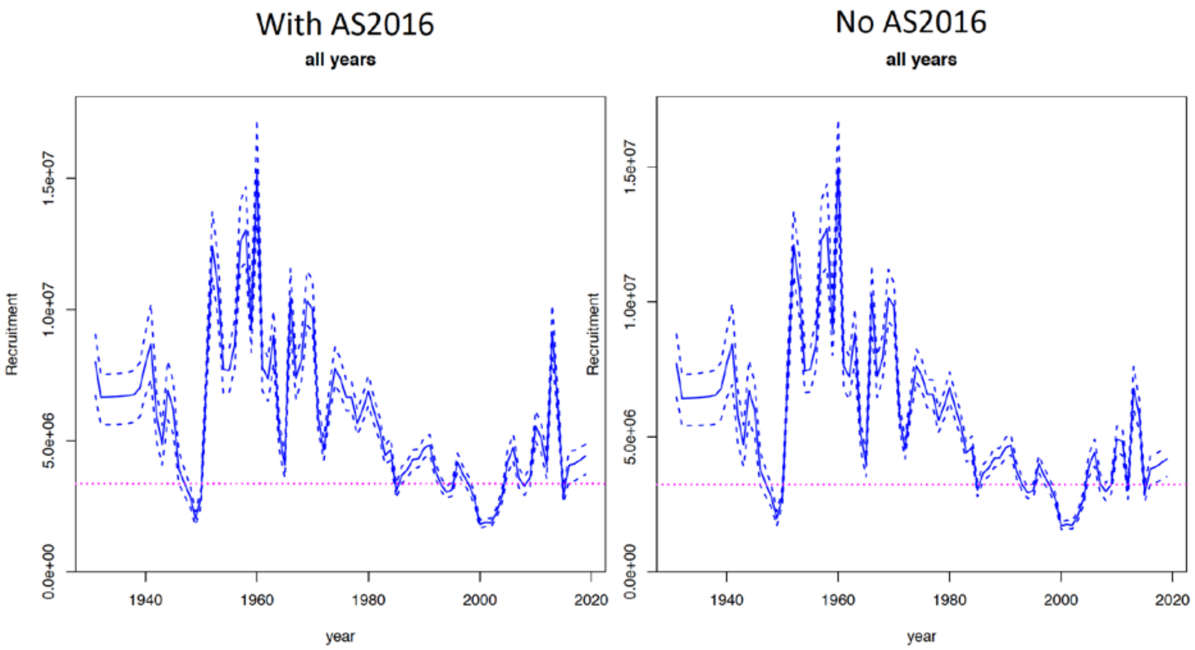

Figure 1. Recruitment estimates with and without the 2016 aerial survey data included.

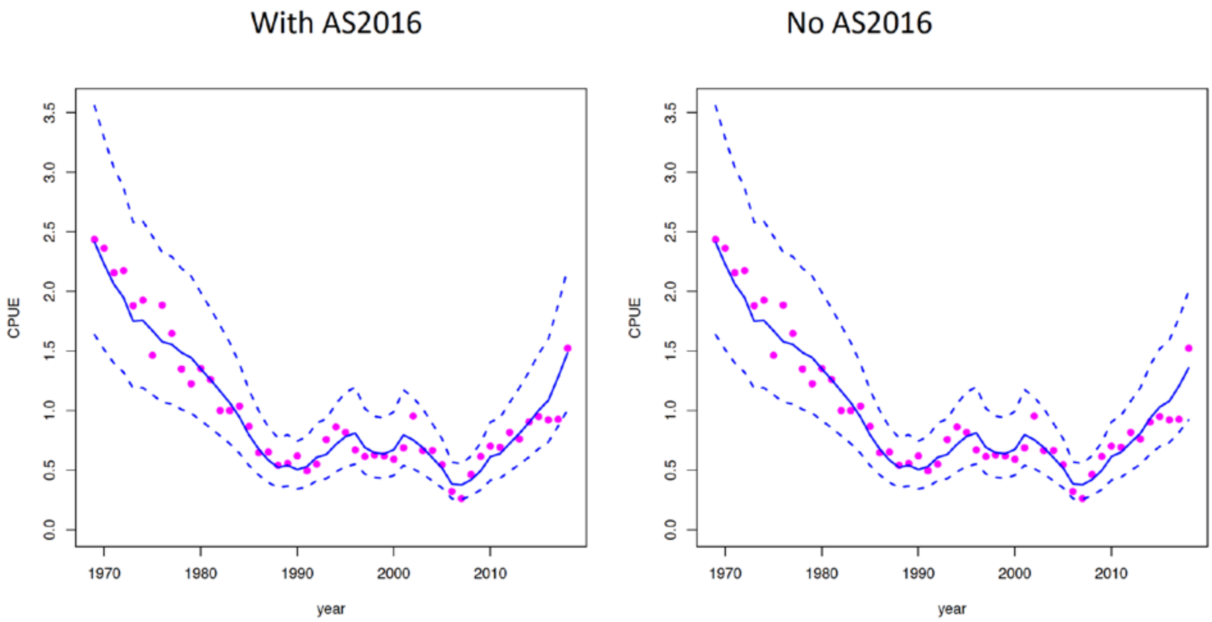

Figure 2. Representative fits to the CPUE with and without the 2016 aerial survey data included.

Figure 3. Representative fits to the aerial survey with and without the 2016 aerial survey data included.

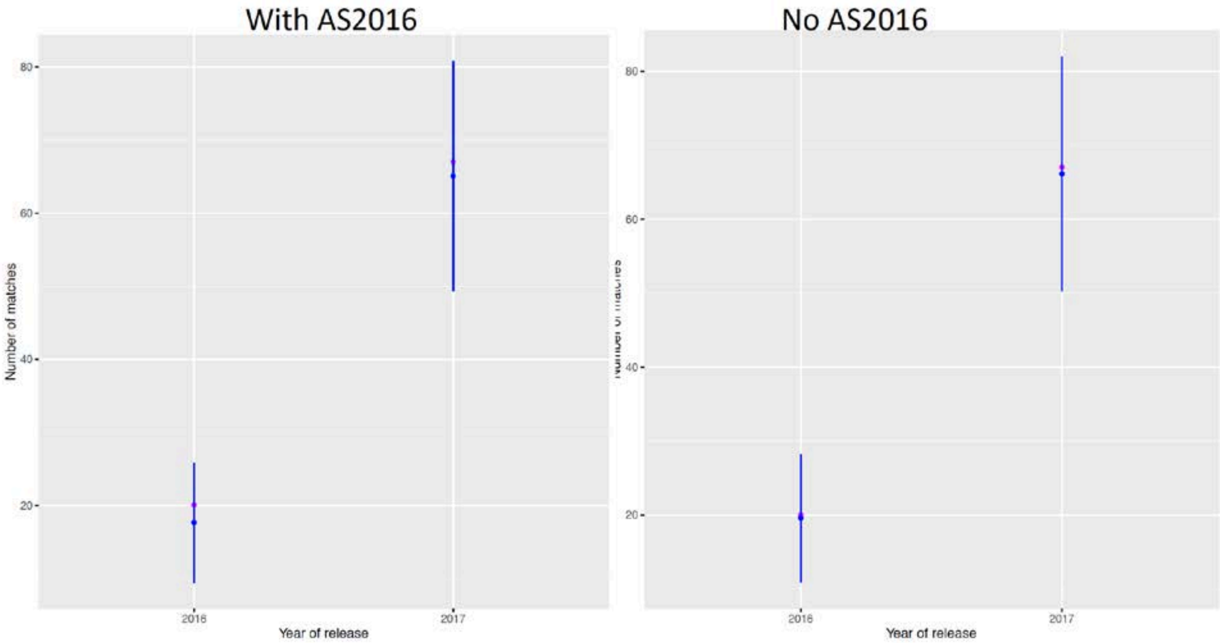

Figure 4. Representative fits to the 2016 and 2017 gene tagging data with and without the 2016 aerial survey data included.

23. The data, including the new gene-tagging data, were generally fitted well. The group discussed some technical issues regarding numerical optimisation and possible problems within individual model runs within the grid. The group agreed that these were matters that should be considered more fully at the 2020 stock assessment, and that selecting the suite of models within the grid was more important than resolving fitting problems for a few individual elements of the grid.

24. The group noted the estimates of 2018 SSB_0 and B10+ are slightly higher than previous estimates, in line with rebuilding expectations, and also the larger SSB_{MSY}/SSB_0 estimate of 27%, consistent with productivity-related parameters in the grid.

25. Notwithstanding the above, the group agreed that the reconditioned OM is satisfactory for MP testing purposes.

<u>Agenda Item 3. Evaluate results from MP testing</u>

3.1 Review results of initial MP trials

26. Australia presented paper CCSBT-OMMP/1906/05 on evaluation of performance of candidate Management Procedures, specifically on the rh12 CMP for base grids and robustness tests.

27. Japan presented paper CCSBT-OMMP/1906/10 on further improvement and performance evaluation of a candidate management procedure for southern bluefin tuna for NT set of CMPs.

28. Japan presented paper CCSBT-OMMP/1906/11 on further improvement in and performance evaluation of a candidate management procedure for southern bluefin tuna for what were previously termed a DMM and now named DMR set of CMPs.

29. All three papers provided brief updates on CMPs described previously, with a focus on applying the CMPs to the reconditioned baseline and robustness test OMs. All three CMPs use CPUE, gene tagging, and CKMR information.

30. In addition, Australia provided an addendum to CCSBT-OMMP/1906/05 on evaluation of CMPs which use only gene tagging and CKMR inputs (and not CPUE), which was also considered in 2018.

31. The primary attributes of these CMPs are summarised in Table 2.

Table 2. Description of CMPs examined at OMMP10.

General overview of CMP				
	rh12	**A49**	**NT4**	**DMR**
Type of CMP	Hybrid version of HCR with a model-based log-linear trend in TRO inferred by an age-structured model using genetic data and an empirical-based-linear trend in CPUE	Same as RH12 MP but uses CK and GT data only and excludes use of CPUE data	Two-phase (before and after 2035, switch depending on POP index) hybrid version of HCR with log-linear trend in CPUE and safeguard by gene-tagging recruitment index (by gene-tagging)	Hybrid versions (different weights) of three of the four different CMPs with different data type inputs (below)
Key references for CMP development	CCSBT–ESC/1709/20, CCSBT-OMMP/1906/05	CCSBT-ESC/1809/20, CCSBT-OMMP/1906/05. Rev1 (addendum)	CCSBT-OMMP/1906/10	CCSBT-OMMP/1906/11
How data are used in CMP				
CPUE	Trend	NA	Slope; gain slow up fast down	Target
CKMR (POP and HSP)	TRO index I_y^{ck}, gain parameter changes smoothly relative to target	TRO (I_y^{ck}) index	Empirical POP, gain param changes depending on biomass relative to target (No HSP)	Pre-specified year-dependent target with a TRO index (I_y^{ck})
Gene Tagging	Limit (recent 5-year average); gain fast down below limit, intermediate range no change, above range, slow increase	Limit (recent 5-year average); gain slow up fast down	Limit (minimum estimated; recent 2-year average); fast down if below limit	Target; gain slow up fast down

3.2 Reconsideration of tuning options and operational constraints

32. The ESC agreed to focus on the two combinations of target level and tuning year: i) 0.30 SSB0 by 2035 and ii) 0.35 SSB0 by 2040, but acknowledged that the availability of new data and the reconditioning of the OMs in 2019 might require further exploration of alternative tuning criteria.

33. In the preliminary evaluations conducted in 2018 a wider range of tuning levels was examined using the initial CMPs, including 0.25 and 0.40 of SSB_0 by 2035. In order to achieve the 0.40 target in 2035, each CMP was required to immediately reduce the TAC substantially. This situation was the reverse in the case of the 0.25 target: in the short-term, CMPs consistently increased TACs to much higher levels, which then required substantial TAC decreases once the target level was achieved (see Table 3). Given the general guidance from the SFMWG on the desirability of incremental increases in TACs, the undesirability of large TAC decreases and, in particular, a preference for relative stability beyond the rebuilding target, the group considered this behaviour for these two tuning levels was likely to be unacceptable and hence decided to focus attention on the 0.30 and 0.35 SSB_0 target levels to be achieved in 2035 and 2040 respectively.

Table 3. Tuning levels evaluated against OMs from 2018 (ESC and OMMP9) and OMMP10.

SSB Tuning	Comment (from 2018)	OMMP10
0.25	Failed because TAC increase would require subsequent decreases	Same issue; only more severe given revised status
0.30	Retained for 2035	ok
0.35	Failed for 2035 (TAC required short-term reduction) therefore changed to 2040 tuning year	TAC reductions required to tune to 2035. Tuning to 2040 was ok.
0.40	Failed, same as 0.35 tuning only more severe	Same issue as tuning to 0.35

34. The reconditioning of the OM including data up to year 2018 resulted in a somewhat less depleted SSB (0.17 (0.15–0.21 90% CI) compared to the 2017 estimate of 0.13), but this was broadly in line with the projections carried out in both 2017 and 2018. During the meeting, a constant catch (at the current TAC) projection was run as a simple test of whether it is possible to attain 35% of SSB_0 by 2035. At the constant current TAC (17,647 tonnes), the median SSB in 2035 was 0.337 SSB0. This clearly implies that to achieve 35% SSB_0 by 2035, TAC reductions would be required in the short-term. The group therefore agreed to maintain focus on the 30% and 35% SSB_0 target levels to be achieved in 2035 and 2040 respectively.

35. The operational constrains specified at the meeting of the strategy and fisheries management working group (SFMWG) in 2018 were maintained, namely:

- Set TACs in 3-year blocks;
- set first TAC decision for 2021-2023 in 2020, noting that the usual lag between TAC setting and implementation will be reduced by one year. Follow the usual schedule after that (i.e., in 2022 set TAC for 2024-2026);

- set maximum TAC changes of 2,000 t, 3,000 t and 4,000 t, and add 5,000 t if the first three did not provide sufficient contrast. Each level of maximum TAC change would not necessarily be applied in combination with all tuning levels.

36. The group decided to use 3,000 as the base, and in order to limit the work involved, evaluate 2,000 and 4,000 as maximum TAC change trials for the 2035 (30%) tuning only (for the base-case tuning).

3.3 Comparison of performance of tuned MPs and possible adjustments

37. Performance of the CMPs on the base OM tuned to meet 30% of SSB_0 by 2035 in median terms is shown in Figure 5. Note that CMP NT4 as described in CCSBT-OMMP/1906/10 set minimum TAC change of 500 t; the CMP was adjusted during the meeting to use a minimum TAC change of 100 t, in line with the other CMPs. This CMP, tuned to achieve 30%SSB_0 by 2035 was named “NT100_3000”.

38. The group noted that i) with the same tuning, all CMPs have near identical conservation performance for the base18 OM; and ii) the A49_3000 and DMRCOMB2_3000 CMPs achieve slightly higher mean TACs than the NT100_3000 and rh12_3000 CMPs with a concomitant trade-off in higher AAV in the rebuild period.

39. The group noted that AAV needs to be interpreted carefully during the rebuild phase because it is essentially a measure which includes the increasing trend in TAC during rebuilding rather than a measure of annual changes in catch alone under a relatively stable biomass once the fishery has rebuilt. High AAV is not therefore necessarily indicative of worse performance.

40. The P(2up1down) performance measure also needs to be treated cautiously. The measure was modified at this meeting (see section 5.1). The A49_3000 and DMRCOMB2_3000 CMPs have lower P(2up1down) than NT100_3000 and rh12_3000 by setting their initial TACs more conservatively. Of note then is that the TACs set by these last two CMPs increase more rapidly initially (hence the higher AAV) to achieve a higher median TAC in the short term (see also Fig. 8).

41. The group recognised that all these CMPs would meet the Extended Commission's requirements using this tuning and that further discrimination requires consideration of performance at other tuning levels, robustness testing, and possibly expected patterns of rebuild and catch. The group also recognised that all the CMPs are still all in development; some convergence in performance has already occurred and will likely increase during the final development phase between OMMP10 and ESC24.

42. Differences in performance at two tuning levels (30%SSB_0 by 2030 and 35% SSB_0 by 2040) can be seen in Figure 6. The difference in the TAC trends between the two sets of CMPs (A49 and DMRCOMB2 CMPs compared to NT100 and rh12) are clear. Also of note is that while the NT100 and rh12 CMPs show similar performance under both tuning levels, the A49 and DMRCOMB2 CMPs are now more different to each other with the A49 CMP showing qualitatively different behaviour at the two tuning levels.

43. For all CMPs, the main difference between the two tunings, the one tuned to 35% SSB_0 by 2040 required lower TACs.

44. The group discussed the CMP behaviours and noted a number of issues, including the now higher starting biomass in the reconditioned OM and the need for CMPs to effect TAC changes quickly to be able to attain tuning levels, the constraints on CMPs of tuning to 35%SSB_0 (see also the constant catch test at section 3.2), the use of maximum TAC changes and caps. Developers are aware of these issues and expect to address them in developing their final CMP development.

45. Robustness tests were run for all CMPs at the 30%SSB_0 by 2035 tuning level (see Figure 7) and for most at the alternative tuning level, with the DMRCOMB2_3500 (not yet run) being replaced by DMRGT_3500. There were small differences in robustness test performance for the two tuning levels, and only those for the 30%SSB0 tuning are shown here. It was noted, however, that for the DMR CMPs, DMRGT appeared to have slightly better conservation performance than the DMRCOMB2 CMP in robustness tests including cpuew0 (i.e. VS CPUE only used in conditioning). As the DMRCOMB2 CMP uses a weighted average of separately tuned CMPs using single data inputs (CPUE, gene tagging, and CKMR), this suggests a reweighting towards higher gene tagging (GT) might be one way to improve the performance of a modified DMRCOMBn CMP.

46. The group discussed the process for selecting and advising on CMPs and the best use of robustness tests, noting that at this meeting no actual discrimination is required, and consideration of robustness test results is to aid in understanding and development. The group agreed that the first need is that any CMP meet the requirements set out by the EC. As all CMPs are in fact tuned to meet those the median depletion requirement, this aspect is guaranteed, and they also all readily meet the requirement of not dropping below 0.2 SSB0 with at least 70% probability. On the base OM grid (base18) testing, at least to date, it appears that the CMPs are likely to display similar performance on all performance measures. All CMPs that meet requirements on the base OM grid are subjected to robustness tests and the relative performance of CMPs can be evaluated. It is notable that all CMPs currently being used for testing at this meeting appear to be robust to the high 2016 aerial survey estimate being removed or to a five-year run of poor recruitment. The problem robustness tests for all CMPs are those that include cpuew0 (i.e. are conditioned on the variable squares CPUE series - see section 2.3). As the VS CPUE is low, these models estimate low biomass in recent years and none of the current CMPs achieves the rebuild target or prevents a high probability of the stock declining below 0.2SSB_0.

47. The group agreed that of the robustness tests considered, AS2016 and reclow5 are highly plausible and it is desirable that CMP performance is robust to them; it also agreed that, in contrast, cpuew0 is an extreme case outside the bounds of the existing grid and has a low plausibility. Additional robustness tests with lower steepness and other options were considered at agenda item 4.1.

48. The group had extensive discussion on whether MP discrimination/selection could be achieved based only on performance measure comparisons, or whether consideration of median trajectories and "worm plots" would help identify other desirable features of interest to the Extended Commission. The group was concerned to emphasise that MP-testing is a mechanism to compare expected performances of management procedures, and is not a stock assessment replacement. It is a tool to support strategic rather than tactical decisions. Nevertheless, the group recognises that expected trajectories may be relevant to selecting a final new MP. Figure 8 shows a composite of median TAC "trajectories[1]" calculated for the representative CMPs tested using the base18 OM. For each CMP it also shows worm plots of 200 individual TAC trajectories selected randomly from the entire set (2000) obtained when sampling across the grid. As noted above, for the current CMPs tuned to 30% SSB0 by 2035 and applied to the base18 OM, A49 and DMRCOMB2 are slightly more conservative in initial TAC settings but increase TACs to an overall higher level by 2035. Individual worm plots for the four CMPs illustrate that the median plots alone may mask the potential for undesirable trajectories (Figure 8).

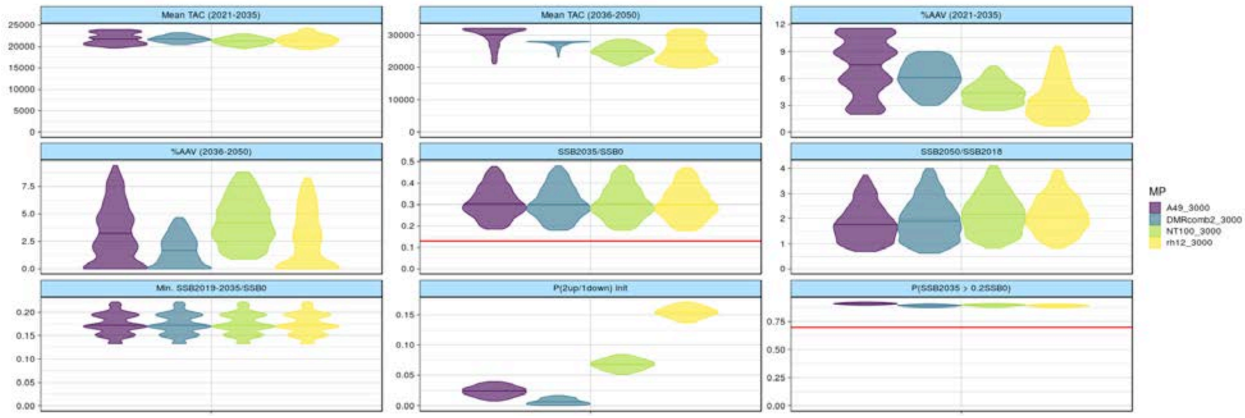

Figure 5. Example presentation of key performance statistics for different CMPs tuned to 30% SSB_0 in 2035 over the base18 grid. Note that the “3000” at the end of each CMP name indicates the maximum allowed change in TAC and the 30 in the OM name refers to the tuning level.

[1] These “trajectories” simply join median values of distributions for each year, so do not reflect an actual trajectory that could occur in practice (in contrast to the individual worms which do).

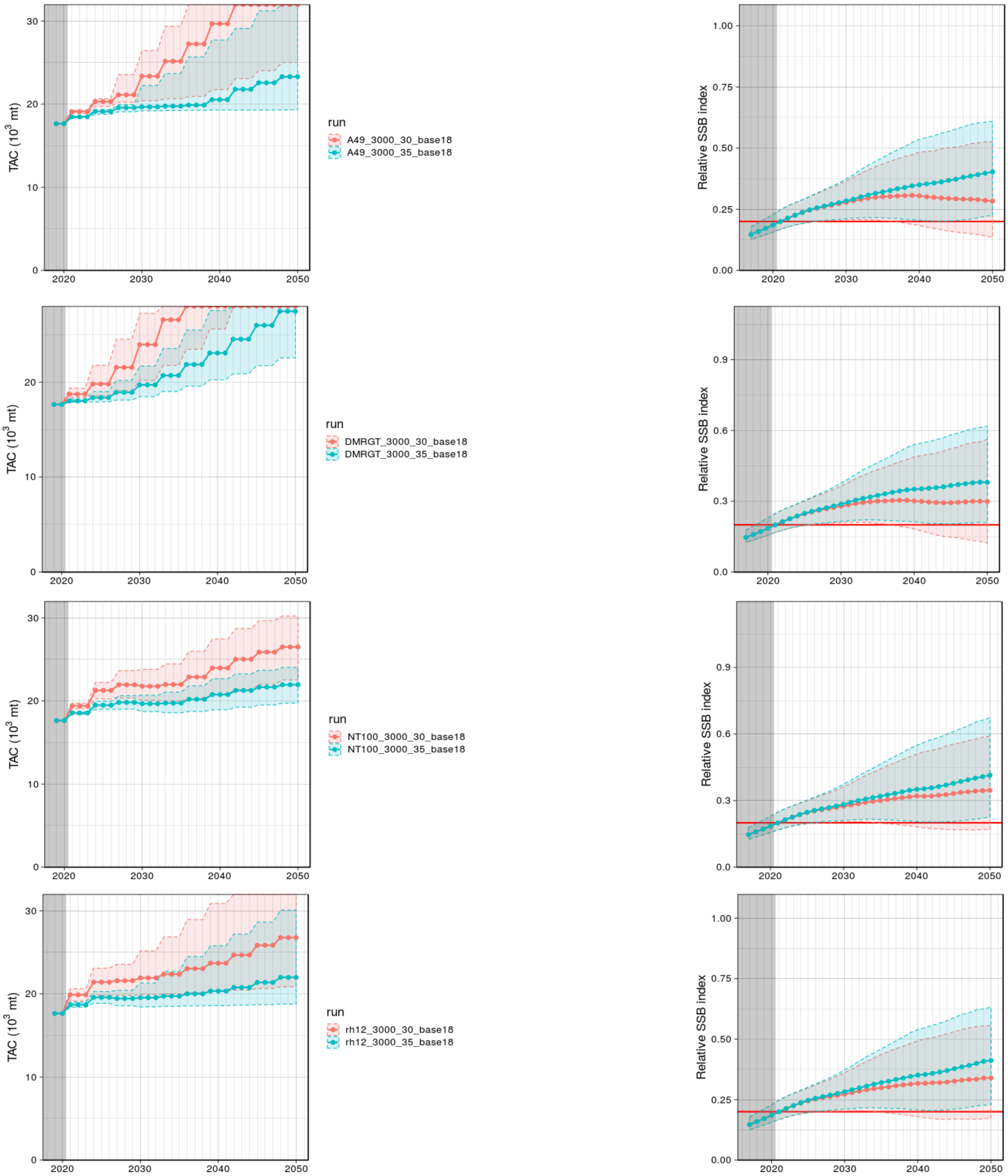

Figure 6. Example of contrasts of four CMPs (by row) tuned to two different tuning levels (30% SSB_0 in 2035 and 35%SSB_0 in 2040).

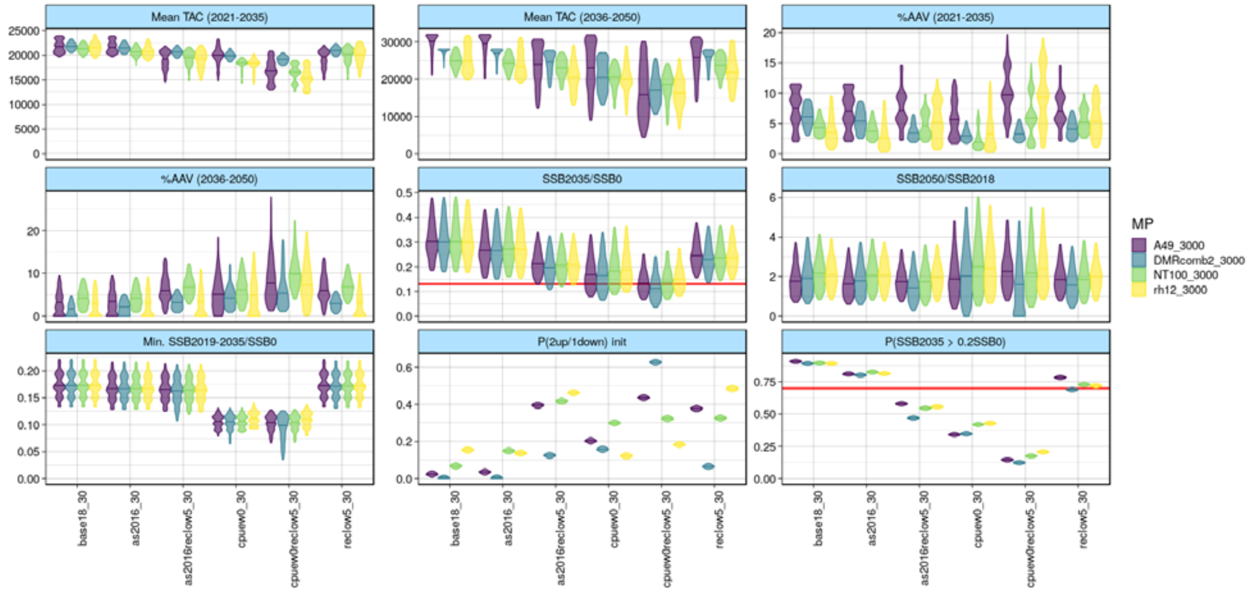

Figure 7. Example presentation of performance statistics for different CMPs by robustness tests compared with the base18.

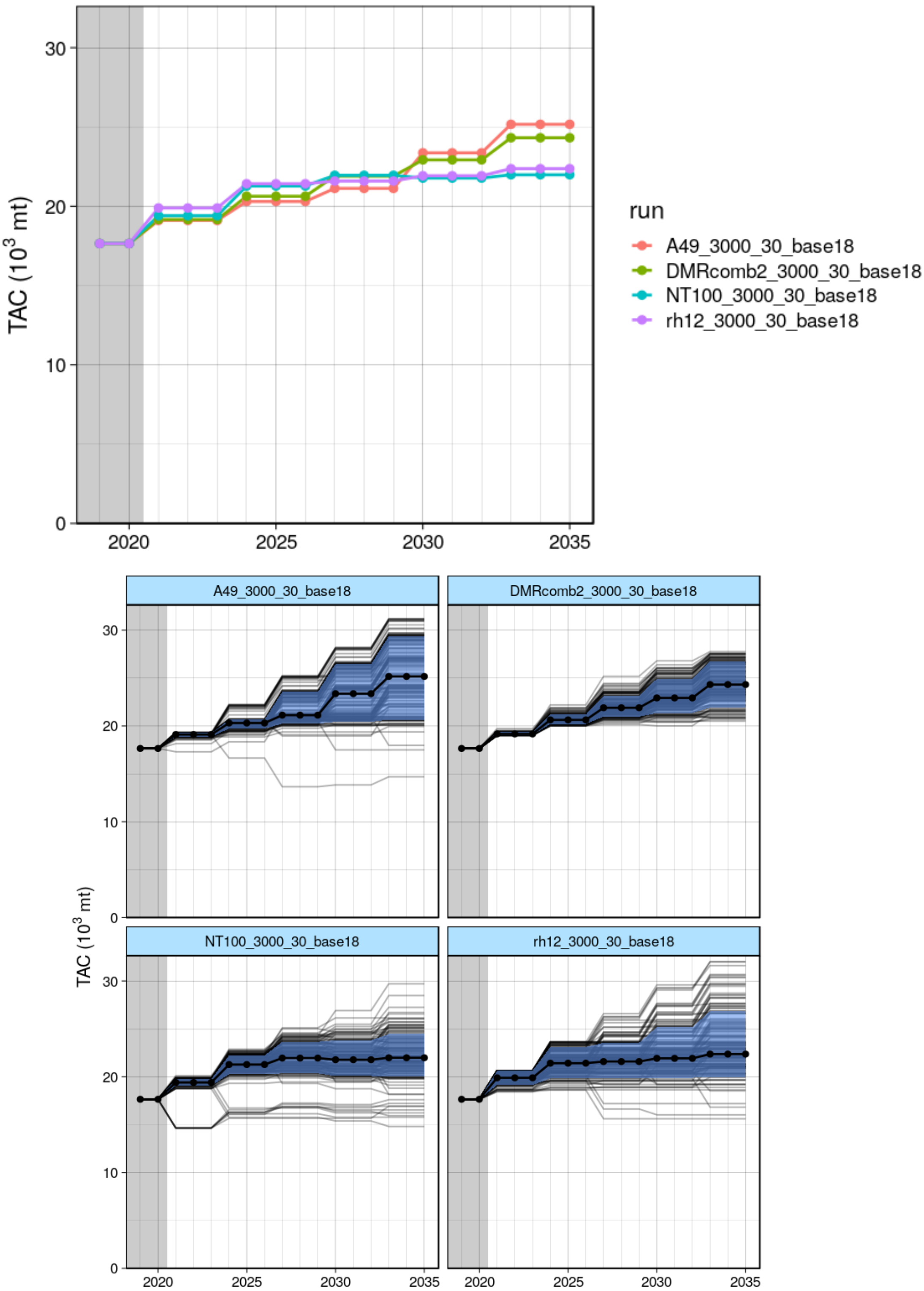

Figure 8. Example of catch trajectories (worms) and 90% confidence intervals for projected TACs under four different CMPs tuned to 30%SSB_0 in 2035.

Agenda Item 4. Reconsideration of robustness trials

4.1 Reconsider priority robustness trials for final testing prior to ESC

49. Robustness testing of the CMPs in development using the reconditioned OM has to date considered a smaller set than in prioritisation Table 4. The group agreed that a further robustness test should be carried out with lower steepness (h=0.55) than in the grid (0.60, 0.70, 0.80). This required conditioning an h55 OM, which was attempted during the meeting. Convergence issues were encountered when combining this low value of h with high values of juvenile natural mortality. While similar problems were encountered in 2018, the more recent data (GT, CPUE) have probably made the OM even less compatible with these low steepness/high M_0 scenarios. In order to avoid this problem, a reduced grid was produced by eliminating the top two M_0 values and keeping only the middle psi value (1.75). This reduced grid did run without problems. The meeting agreed to use a reduced grid in terms of the M_0 values, but to include all psi values as used in the base reference set as the "h55" robustness test.

50. The group agreed to add further robustness tests to those presented at OMMP10. These included the fitting of the grid excluding both the AS2016 data point along with the 2018 CPUE data point (AS2016cpue18). The set of selected robustness tests is shown in Table 5 below (the complete list is provided in **Attachment 4**).

Agenda Item 5. Performance statistics

5.1 Performance statistics, tables and graphics

51. Tables and graphics for CMP performance evaluation were discussed and revised throughout the meeting.

52. During evaluations of CMPs, it was recognised that the P(2up1down) performance measure had been wrongly coded. The measure is intended to capture the probability of two TAC increases followed by one TAC decrease over the first three TAC changes informed by the CMP. However, the measure used to date wrongly calculated the P(2up1down) from CMP implementation until the tuning year, and excluded the first TAC change. The code was amended, and the performance measure now works as intended. All uses of P(2up1down) in this report are now corrected.

53. The group developed a new performance statistic that reflected the change in TAC in 2024 and in 2027, which may need to be considered in further evaluations.

Agenda Item 6. Workplan and timetable

6.1 Update code of OM and associated graphics files

54. Details of this work are addressed in the intersessional workplan discussions in next section.

6.2 Reconsideration of Workplan

55. The tables below outline recent and planned work, and the naming conventions used for CMP testing prior to ESC. The "xxx" values are intended to be replaced by the CMP names.

Table 4. Elements of workplan for MP development and implementation.

2019		
May		Data exchange.
May/June		Webex for conditioning issues should they arise.
June 24-28th	OMMP10	**Recondition the OM** and review initial updated versions of CMPs to develop a limited set to put forward to the ESC.
	OMMP10	Github reconfiguration to facilitate running all tests.
July 1st	Post OMMP10	Distribute letter to Commissioners from ESC and OMMP chairs requesting further guidance on CMP performance.
Pre ESC		Noting that a minor change in the 2019 and 2020 catches (removed 306t and accounted for carryover). Complete reconditioning of OM robustness tests grids: h55, fis20, cpueupq, cpueom75, as2016cpue18. Developers complete all tests as specified in Table 5 below.
September	ESC + 1 day OMMP	Review and advice on set of CMPs .
October	EC	Aim to select and **adopt MP**.
2020		
June	Special EC/ESC	Contingency placeholder in case more time is needed to complete evaluation.
June	OMMP11	Stock assessment.
September	ESC	Implementation of adopted MP to provide **TAC advice for 2021** (i.e., no standard 1-year lag) (note, this MP implementation will include the 2020 data exchange). **Updated assessments including projections using adopted MP .**
October	EC	Agrees TAC for 2021-2023.

Table 5. Specification of base (base18) and selected robustness trials. In the naming convention, the "xxx" is to accommodate the CMP name.

Name	Tuning year, level	Max TAC change	Trials	Sort order
xxx_2000_30_base18	2035, 30%	2,000	Base	1
xxx_3000_30_base18	2035, 30%	3,000	Base, plus all robustness	1
xxx_4000_30_base18	2035, 30%	4,000	Base	1
xxx_3000_35_base18	2040, 35%	3,000	Base, plus all robustness	1
Robustness list	2035, 30%	3,000		1
xxx_3000_30_as2016	2035, 30%	3,000		2
xxx_3000_30_as2016cpue18	2035, 30%	3,000		11
xxx_3000_30_as2016reclow5	2035, 30%	3,000		9
xxx_3000_30_cpueom75	2035, 30%	3,000		3
xxx_3000_30_cpueupq	2035, 30%	3,000		4
xxx_3000_30_cpuew0	2035, 30%	3,000		5
xxx_3000_30_cpuew0reclow5	2035, 30%	3,000		10
xxx_3000_30_fis20	2035, 30%	3,000		6
xxx_3000_30_h55	2035, 30%	3,000		7
xxx_3000_30_reclow5	2035, 30%	3,000		8
xxx_3000_35_as2016	2040, 35%	3,000		2
xxx_3000_35_as2016cpue18	2040, 35%	3,000		11
xxx_3000_35_as2016reclow5	2040, 35%	3,000		9
xxx_3000_35_cpueom75	2040, 35%	3,000		3
xxx_3000_35_cpueupq	2040, 35%	3,000		4
xxx_3000_35_cpuew0	2040, 35%	3,000		5
xxx_3000_35_cpuew0reclow5	2040, 35%	3,000		10
xxx_3000_35_fis20	2040, 35%	3,000		6
xxx_3000_35_h55	2040, 35%	3,000		7
xxx_3000_35_reclow5	2040, 35%	3,000		8

6.3 Issues to be discussed at ESC

56. These were covered through the existing agenda items above.

6.4 Other issues

57. The group noted that projection code outputs need to include the time series of data used in the CMPs (i.e., gene-tagging, POP and HSP observations, the CKMR TRO index (I_y^{ck}), in addition to the CPUE). These outputs will be needed to evaluate exceptional circumstances in the future as part of MP implementation.

Adoption of report

58. The report was adopted.

Close of meeting

59. The meeting closed at 1343 hrs 28 June 2019.

List of Attachments

1	**List of Participants**
2	**Agenda**
3	**List of Documents**
4	**Robustness tests**

Attachment 1. List of Participants

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Attachment 2. Agenda

Agenda Item 1. Review workplan schedule and progress to date

Agenda Item 2. Operating model and data inputs

2.1 Gene tagging

2.2 Close-kin: POPs and half-sibling indices

2.3 CPUE

2.4 Small fish in the Indonesian catch

2.5 Reconditioning of OM

Agenda Item 3. Evaluate results from MP testing

3.1 Review results of initial MP trials

3.2 Reconsideration of tuning options and operational constraints

3.3 Comparison of performance of tuned MPs and possible adjustments

Agenda Item 4. Reconsideration of robustness trials

4.1 Reconsider priority robustness trials for final testing prior to ESC

Agenda Item 5. Performance statistics

5.1 Performance statistics, tables and graphics

Agenda Item 6. Workplan and timetable

6.1 Update code of OM and associated graphics files

6.2 Reconsideration of Workplan

6.3 Issues to be discussed at ESC

6.4 Other?

Adoption of report

Close of meeting

Attachment 3. List of Documents

(CCSBT-OMMP/1906/)

1. Provisional Agenda
2. List of Participants
3. List of Documents
4. (Australia) Changes to SBT OM conditioning code (OMMP Agenda Item 2.5)
5. (Australia) Updated candidate MP performance summary on reconditioned grid (OMMP Agenda Item 3.1)
6. (CSIRO) Notes on the gene-tagging data provided in 2019 (OMMP Agenda Item 2.1)
7. (CSIRO) Notes on the Close-kin Mark-Recapture data provided in 2019 (OMMP Agenda Item 2.2)
8. (Japan) Change in operation pattern of Japanese southern bluefin tuna longliners in the 2018 fishing season (OMMP Agenda Item 2.3)
9. (Japan) Update of the core vessel data and CPUE for southern bluefin tuna in 2019 (OMMP Agenda Item 2.3)
10. (Japan) Further improvement and performance evaluation of a candidate management procedure ("NT4") for southern bluefin tuna (OMMP Agenda Item 3)
11. (Japan) Further Exploratory Investigations of Some Simple Candidate Management Procedures for Southern Bluefin Tuna (OMMP Agenda Item 3)

(CCSBT-OMMP/1906/Rep)

1. Report of the Twenty Fifth Annual Meeting of the Commission (October 2018)
2. Report of the Twenty Third Meeting of the Scientific Committee (September 2018)
3. Report of the Ninth Operating Model and Management Procedure Technical Meeting (June 2018)
4. Report of the Fifth Meeting of the Strategy and Fisheries Management Working Group (March 2018)
5. Report of the Twenty Second Meeting of the Scientific Committee (August - September 2017)
6. Report of the Eighth Operating Model and Management Procedure Technical Meeting (September 2017)
7. Report of the Special Meeting of the Commission (August 2011)
8. Report of the Sixteenth Meeting of the Scientific Committee (July 2011)

Attachment 4. Robustness tests

Table 6. List of robustness test for MP testing. The selected subset of tests to be conducted prior to the ESC are shaded in grey.

Test name	Code	Conditioning and projection notes	Priority	Code?
lowR10	reclow10	Reduce future recruitment by half during the first n years. For 2018, n was set to 10.	L	
lowR5	reclow5	Reduce future recruitment by half during the first n years. For 2018, n was set to 5.	H	
highR	rechigh	Increase future recruitment by 50% during the first n years. For 2018, n was set to 5.	M	Easy
h=0.55	h55	Just check any estimation tweaks that might be required	M	
IS20	fis20	Indonesian selectivity flat from age 20+	M	
Upq2008	cpueupq	CPUE q increased by 25% (permanent in 2008)	H	
Omega75	cpueom75	Power function for biomass-CPUE relationship with power = 0.75	H	
Var sq. CPUE	cpuew0	Variable squares	L	
Const sq. CPUE	cpuew1	Constant squares	L	
S50CPUE	cpues50	50% of LL1 overcatch associated with reported effort	M	
S00CPUE	cpues00	Overcatch had no impact on CPUE	L	
Drop q increase	cpuenocrp	of 0.5% yr-1 in future years – no continuous effort creep	L	Easy
High fut. CPUE CV	cpuehcv	Increase the future CPUE CV to 30% (currently 20%)	M	
	cpue59	Age range from 5-9, check connection between OM and projections…seem to be passed through so ok	M	
Aerial2016	as2016	Remove the 2016 aerial survey data point	H	
	reclow5as2016	Combination of reclow5 and as2016	H	
	reclow5cpuew0	Combination of reclow5 and cpuew0	L	
	as2016cpue18	Remove the 2016 aerial survey data point and 2018 CPUE	H	
	reclow5h55	Combination of reclow5 and h55	M	
q_hsp1	hspq1	Set HSP proportionality coefficient to 1, to be moved to reference set, next year	M	
GT q high	gtqh	q=1.15 Specifics and rationale to be determined	L	
GT overdisp.	gtod	Use over-dispersion as applied to conventional tagging	M	
GT qtrend	gtqtr	1% increase per year, note that an increasing q leads to over-estimated abundance	M	Easy
GT q low	gtql	q=0.85, Specifics and rationale to be determined	M	
GTI	troll	Includes the grid type trolling index as additional recruitment index. Increase CV of aerial survey to preclude aerial survey dominating the fit, given apparent conflicts in the data.	L	
Corr Sel	selrev	Reversing order of estimates at decadal scale "Corrugated selectivity"	L	Hard

Test name	Code	Conditioning and projection notes	Priority	Code?
	selalt	Five year blocks of Alternate bimodal and recent selectivity, most extreme case of bimodality should be used (for projections).	M	Hard
LL1 Case 2 of MR	case2	LL1 overcatch based on Case 2 of the 2006 Market Report	L	
SFOC40	sfo40	40% overcatch by Australian surface fishery: ramps up from 1% in 1992 to 40% by 1999 and onwards to 2016. Adjust the age composition as was done for the 20% method. Continued 40% overcatch in projections	M	
SFO00	sfo00	No historical additional catch in surface fishery. No future additional catch in surface fishery	L	
HighaerialCV		In conditioning set process CV to 0.4 Not needed, the Aerial2016 scenario is sufficient to captures this	No	
Updownq		CPUE q increased by 50% in 2009 then returned to normal after 5 years	No	
GamCPUE		Use the "GAM CPUE" series provided from Australia under the 2017, CCSBT data exchange. This is the monitoring CPUE series 3. Not included because it was intermediate of other CPUE series	No	
CPUE w/o area 7		As a sensitivity to note a possible concentration effect on CPUE. Not included as difference minor (Itoh-san paper) but monitoring required	No	
CPUE placeholder		Forward looking scenario about how q and/or selectivity might change if stock abundance and distribution changes significantly	No	
Incomplete tag mixing		Sensitivity to incomplete mixing of tagged fish released in the WA and GAB. Increases fishing mortality of tagged fish by 50% relative to the whole population for the surface fishery (season 1).	No	
Piston line		Includes the piston-line troll survey index as additional recruitment index. Increase CV of aerial survey to preclude aerial survey dominating fit.	No	
Independent C-K		TBD based on independent close-kin stand-alone estimates. Nothing emerged from the stand-alone estimates	No	
Psi		Grid sampling using objection function weighting psi. Objective function weighting instead of uniform for psi.	No	
Noh.8		Change steepness (h) preference weighting to 0.5, 0.5, 0.0 to examine impact of excluding h=0.8 on projections.	No	
Bimodal select.		The most extreme case shown in Fig. 11 of OMMP8 report	No	
POPs only		Implemented by increasing the variance on other trend data or some other approach	No	
AR-B0		AR process applied to SSB0 . No, the reference set includes an AR1 process.	No	

Test name	Code	Conditioning and projection notes	Priority	Code?
Nonstationary SSB0		Based on historical analysis	No	
Nonstationary stock-recruitment relationship		Based on historical analysis of residuals. No, the reference set already includes an AR1 process.	No	
Missing MP data		No, it is picked up in over-dispersion scenarios	No	