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**Reference Paper Covering SC20/SMD02/TCC20 Recommendations relating to
 Harvest Strategies**

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Submitted by the Secretariat

Purpose

The purpose of this paper is to support the Commission’s consideration of recommendations from SC20, SMD02, and TCC20 relating to harvest strategies that require decision or action at WCPFC21. The relevant recommendations from each meeting are presented below and also available in the complete meeting Summary Reports.

Harvest Strategy Recommendations

Skipjack Tuna

a. Skipjack tuna management procedure

SC20	<p>1. SC20 noted that the Interim Skipjack Management Procedure (CMM 2022-01) calls for the review of the performance of the Management Procedure in 2025 and that WCPFC20 noted that a re-evaluation of the skipjack estimation method may need to be undertaken prior to the next implementation of the MP. SC20 recommended that the SSP evaluate the following potential approaches to modify the estimation method for the WCPO skipjack interim MP, using the current OM grid and HCR, to evaluate whether the performance of the MP would change if the EM is revised, and report back to SC21 on outcomes and recommendations:</p> <ul style="list-style-type: none"> a. Modification of tropical CPUE abundance indices in the existing estimation method along the lines of the approach taken using unassociated set purse seine CPUE data by the 2022 stock assessment. b. Further investigation of alternative stock assessment platforms and modelling approaches. (<i>ref: SC20 Outcomes, paragraph 98</i>)
	<p>2. SC20 recommended that the SSP provide the information presented in SC20-MI-WP-01 as well as outcomes from the discussions at SC20 to SMD for further discussion and consideration. (<i>ref: SC20 Outcomes, paragraph 99</i>)</p>
	<p>3. SC20 further recommended that SC21 review the outputs from the re-evaluation and provide recommendations to WCPFC22 regarding the potential need to revise the current interim skipjack MP (CMM 2022-01). (<i>ref: SC20 Outcomes, paragraph 100</i>)</p>

b. Monitoring strategy for skipjack tuna

SC20	<p>1. SC20 requested that the SSP conduct the following analyses related to the monitoring strategy for skipjack:</p> <ul style="list-style-type: none"> a. Evaluate whether changes in the FAD closure duration (as adopted in CMM 2023-01) will affect the performance of the interim MP; b. Representativeness and appropriateness of candidate CPUEs for use in MP. (<i>ref: SC20 Outcomes, paragraph 101</i>)
	<p>2. SC20 recommended that in years when an assessment is not conducted, the monitoring strategy could be reviewed by SC and feedback provided through the Online Discussion Forum. (<i>ref: SC20 Outcomes, paragraph 102</i>)</p>
	<p>3. SC20 was invited to review the information provided in the Monitoring Strategy included in Table 1 of SC20-MI-WP-02, and to update the text in column 1 (SC) as appropriate. SC20 recommended the following modifications to Table 1 (<i>Monitoring strategy for the skipjack Management Procedure</i>):</p> <ul style="list-style-type: none"> a. Amend sub-paragraph a) of Element 1.a) (comparison of predicted MP performance against the latest stock assessment outcomes) to read “The performance of the MP in managing skipjack tuna to achieve defined objectives, including the TRP”. b. Amend element 1.b) (Data availability to run the MP) to include a new comment for SC20: “The effect of changes made to the historical data is not known”. (<i>ref: SC20 Outcomes, paragraph 103</i>)
	<p>4. SC20 recommended the monitoring strategy be forwarded to the SMD, TCC and the Commission for their consideration. (<i>ref: SC20 Outcomes, paragraph 104</i>)</p>
SMD02	<p>5. SMD02 thanked the SSP for the updated skipjack monitoring strategy (WCPFC-SMD02-2024-BP-06), which, amongst other things, provided clear guidance on what technical advice TCC can provide to the Commission. SMD02 supported the approach of not making adjustments to the key elements of the monitoring strategy on an annual basis, but that modelling be undertaken as part of the next review of the management procedures in 2026, including for scenarios related to climate change. (<i>ref: SMD02 Summary Report, paragraph 172</i>)</p>
	<p>6. SMD02 recommended that as part of the next regular review of the skipjack management procedure, the Commission directly incorporate SEAPODYM and/or other model projections into the skipjack management strategy evaluation operating model grid projections. (<i>ref: SMD02 Summary Report, paragraph 173</i>)</p>
TCC20	<p>7. TCC20 recommended to the Commission that it adopt the SKJ monitoring strategy (TCC20-2024-17 rev1), noting the updates and input provided by TCC20. (<i>ref: TCC20 Outcomes, paragraph 38</i>)</p>
	<p>8. TCC20 noted that, as the Commission adopts more Management Procedures, there could be a need for a standing item on the TCC agenda to consider Management Procedures. (<i>ref: TCC20 Outcomes, paragraph 39</i>)</p>

South Pacific albacore tuna

a. Target reference points

SC20	<p>1. SC20 recognized that WCPFC20 adopted an interim TRP for South Pacific albacore, defined as 4% below the estimated average spawning potential depletion of the stock over the period 2017-2019 ($0.96 SB_{2017-2019}/SB_{F=0}$). SC20 recommended the Commission note that the biomass depletion associated with the adopted interim TRP has been re-estimated to be 50% according to the 2024 SPA stock assessment outcomes. This biomass depletion when the interim TRP was adopted by WCPFC20 was previously estimated at 47% based on the 2021 SPA stock assessment. (ref: SC20 Outcomes, paragraph 105)</p>
	<p>2. SC20 recommended the SMD and the Commission consider results from the evaluation of a range of alternative candidate south Pacific albacore target reference points provided in SC20-MI-WP-03, in reviewing the interim TRP and other scenarios recommended by SC20. (ref: SC20 Outcomes, paragraph 106)</p>
	<p>3. SC20 recommended that both catch numbers and weight be used for projections to inform the Commission discussion on reviewing the interim TRP for South Pacific albacore noting that projections conducted in terms of weight are more consistent with the MP evaluations and management through, for example, a TAC. SC20 further recommended that SSP present trends in vulnerable biomass among specific WCPFC-CA longline fleets, and for WCPFC-CA catch levels to also be related to 2017-2019 levels. (ref: SC20 Outcomes, paragraph 107)</p>
	<p>4. SC20 recommended including more scenarios for projections by fixing EPO catch at 2017-2019 levels and using multiple catch levels in the WCPFC-CA related to 2017-2019 levels. (ref: SC20 Outcomes, paragraph 108)</p>
SMD02	<p>5. SMD02 reviewed a summary of the 2024 SP-ALB stock assessment before the SSP presented WCPFC-SMD02-2024-BP-01 and noted the recent high catches of South Pacific albacore in the Eastern Pacific Ocean. SMD02 generally supported maintaining the use of both weights and numbers in the South Pacific albacore catch-based projections. (ref: SMD02 Summary Report, paragraph 57)</p>

b. South Pacific albacore operating models

SC20	<p>1. SC20 adopted the operating model (OM) reference set, together with the proposed robustness set (Table 2, SC20-MI-WP-04), for the evaluation of candidate south Pacific albacore MPs. (ref: SC20 Outcomes, paragraph 109)</p>
	<p>2. SC20 noted there are concerns about the range of uncertainty covered by the current operating model set. SC20 recommended that future work to elaborate the OM sets be conducted through the monitoring strategy and could include:</p> <ul style="list-style-type: none"> a. development of scenarios for the impacts of climate change b. consideration of potential effects of effort creep and/or hyperstability in CPUE

	<p>c. development of models that address uncertainties around stock structure to the robustness set. (ref: SC20 Outcomes, paragraph 110)</p>
	<p>3. SC20 recommended that simulations be conducted to explore the implications of assuming a single stock OM when there could be multiple stocks. If ongoing genetics work confirms the presence of multiple-stocks and the simulations indicate that the single-stock assumption made in the OMs is problematic, then exceptional circumstances should be considered and the OM sets should be revised to account for multiple reproductive stocks in the South Pacific. (ref: SC20 Outcomes, paragraph 111)</p>

c. South Pacific albacore management procedure

SC20	<p>1. SC20 recommended that SSP focus primarily on the following two ASPM-derived estimators with a view to having a robust estimator, without obvious future data vulnerabilities:</p> <ul style="list-style-type: none"> a. A direct biomass depletion approach using mean $SB/SB_{F=0}$ of the last three years; and b. A ratio approach that uses Mean $SB/SB_{F=0}$ of the last three year (same as in 1.a) relative to 2017-2019. (ref: SC20 Outcomes, paragraph 112)
	<p>2. SC20 noted that there was bias in estimation model performance at low predicted stock sizes. SC20 recommended that this bias be addressed through the design of the HCR and its significance or otherwise will be evaluated through evaluation of candidate MPs. Should the estimation model bias become problematic in the MP design context, then steps will need to be taken to address that issue. (ref: SC20 Outcomes, paragraph 113)</p>
	<p>3. SC20 recommended that SSP conduct a Management Strategy Evaluation of a range of candidate MPs, using updated estimators together with HCR and maximum change metarule specifications similar to those presented at SC19 (SC19-MI-WP-06). (ref: SC20 Outcomes, paragraph 114)</p>
	<p>4. SC20 recommended that SSP, in addition to running projections assuming a single baseline for all fisheries within the Management Procedure evaluations, explore the potential implications of using different reference periods for different fisheries and gears within the MP. (ref: SC20 Outcomes, paragraph 115)</p>
	<p>5. SC20 recommended that EPO catches be assumed to remain constant at recent levels but with an exploration of a case where the EPO is subject to MP controls (in a similar way to SC20-MI-WP-03). (ref: SC20 Outcomes, paragraph 116)</p>
	<p>6. SC20 noted that it was desirable to constrain the number of candidate MPs evaluated for consideration and recommended that steps be taken to manage this, including using one-off variations from a base-case scenario, rather than a full factorial grid of options. (ref: SC20 Outcomes, paragraph 117)</p>

	<p>7. SC20 recommended that, to the extent possible, the results of the above candidate MP evaluations be provided to the SMD and the Commission for their consideration or decision. (ref: SC20 Outcomes, paragraph 118)</p>
SMD02	<p>8. SMD02 expressed appreciation for the evaluations undertaken by the SSP of selected candidate Management Procedures for South Pacific albacore (WCPFC-SMD02-2024-BP-02). (ref: SMD02 Summary Report, paragraph 83)</p>
	<p>9. SMD02 supported maintaining all the current performance indicators noting that those focused on vulnerable biomass and catch stability are critical for South Pacific albacore fisheries. (ref: SMD02 Summary Report, paragraph 84)</p>
	<p>10. SMD02 supported a 3-year frequency for running the South Pacific albacore Management Procedure (MP), which is in line with the current skipjack MP, the South Pacific albacore assessment schedule, and the biology of South Pacific albacore, and which balances responsiveness to stock status changes and stability for fishery operations. (ref: SMD02 Summary Report, paragraph 113)</p>
	<p>11. SMD02 supported the removal of candidate MPs that use an absolute estimator, and MPs using Harvest Control Rule (HCR) 4, from the set of candidate MPs provided in WCPFC-SMD02-2024-BP-02. (ref: SMD02 Summary Report, paragraph 114)</p>
	<p>12. SMD02 agreed to the additional work set out in Table 1. SMD02 also suggested that other items on the list be further considered by the Commission within the prioritization process of the work of the SSP in 2025 as appropriate. (ref: SMD02 Summary Report, paragraph 128)</p>
	<p>13. SMD02 noted that there were several requests from WCPFC20 and SC20 regarding SP-ALB TRPs, SP-ALB MP-related analyses, and BET/YFT TRP analyses, which the SSP is currently undertaking. These requests, as well as the SP-ALB MP analysis requests, which do not require additional science units and can be managed within SSP existing resources are outlined in Table 2. (ref: SMD02 Summary Report, paragraph 129)</p>
	<p>14. SMD02 requested that the data used in SPAMPLE¹ be made available either publicly or on request, in accordance with the Commission’s data rules. (ref: SMD02 Summary Report, paragraph 130)</p>

SMD02 Tables 1 and 2:

<p>Table 1 – List of new SP-ALB MP-related analyses to be prioritised for attention by SSP before WCPFC21, in addition to ongoing analyses requested by WCPFC20 and SC20, or requested by SMD02 which do not require additional science units. Analyses in the blue shaded cells (12/13 and 14) were selected by ballot of participating CCMs at SMD02 for implementation.</p>				
Subject	Request	Technical feasibility	Science units	SSP Notes

¹ [SPAMPLE](#) is an online tool for exploring and comparing the performance of alternative candidate management procedures (MPs) for South Pacific albacore.

SP-ALB TRPs	1. Perform evaluation setting EPO Catches to 2017-2019 avg levels	OK	2	SC20 request
SP-ALB MPs	3. Evaluate MPs based upon effort	Medium, currently possible for LL fisheries only	10	WCPFC20 request. Run across the reduced grid of 7 MPs that SMD02 defined.
	4. Evaluate MPs with EPO fishing set at 2017-19 levels	OK	-	Done as a one-off sensitivity for SMD02. Could be used as a robustness test for 'adopted' MP.
	5. Provide VB performance indicator relative to 2020-2022	OK	-	Done for SMD02
	11. Exclude archipelagic waters from the MP control	OK	-	Part of the MSE framework that had not been fully developed in time for SMD02 but will be added.
	12/13. Evaluate new MP: HCR where threshold level is to the left of the iTRP	OK	2*	Modification of HCR1 with a 5% constraint and relative input into the HCR. The absolute change point at $0.45SB_{F=0}$ will be translated into the relative equivalent. NOTE: on the assumption that just on catch-based MPs. If also anticipated for effort-based MPs, 4 science units.
	Evaluate new MP: HCR where change point is at 0.85 and a constraint of 20%			Modification of HCR1 and relative input into the HCR. NOTE: on the assumption that just on catch-based MPs. If also anticipated for effort-based MPs, 4 science units.
	14. Evaluate HCR where Hillary step lies across the range 0.37 to $0.47SB_{F=0}$ after EM bias correction ¹	OK	2*	Modification of HCR2 design with a 5% constraint and relative input into the HCR (see footnote 1). NOTE: on the assumption that just on catch-based MPs. If also anticipated for effort-based MPs, 4 science units.
15. Make data within SPAMPLE available	OK, dependent upon the format of the data being requested	-	Data underpinning the plots within SPAMPLE are available on request.	
BET/YFT TRPs	16. Re-evaluate setting R2 YFT 'miscellaneous fisheries' fishing to more recent levels	OK	4	SC20 request. YFT R2 fishing will be in terms of effort. Implies re-running the 'nuclear grid'.

(Maximum number of points available before WCPFC21, in addition to ongoing work: 4)

Footnote¹: Details for proposed HCR:

HCR	Type	SB/SB _{F=0min}	Scalar _{min}	Scalar _{max}	Curve	Step _{min}	Step _{max}	Height	Constraint
2	'Hybrid'	0.2	0.42	1.2	1	0.37	0.47	1.2	5%

Table 2. List of new SP-ALB MP-related analyses that were *not* prioritized for the work of the SSP before WCPFC21. Analyses with ~~strike through~~ (2 and 17) were not included in the ballot because they were considered unnecessary (item 2) or not feasible within the time available prior to WCPFC21 (item 17). The remaining analyses (6, 7, 9, 10, and 17) could be considered by WCPFC21 for implementation in 2025 if still necessary.

Subject	Request	Technical feasibility	Science units	SSP Notes
SP-ALB TRPs	2. Present vulnerable biomass outcomes relative to 2020-2022 levels	OK	1	SMD02 request. Note results within SPAMPLE are presented in this way and were considered sufficient, so no science units were considered necessary.
SP-ALB MPs	6. Evaluate the impact of MP not applying to PICT fleets in 1a, 1b, 1c, 1d	OK	3*	Perform as a one-off sensitivity from HCR1 with a 5% constraint using a relative HCR input. Fishing of the uncontrolled 'PICT' fleets set to 2017-2022 average. NOTE: if this were across all 7 MPs, this would be 10 science units. Catch-based MPs only. If also on effort, 6 science units are required.
	7. Evaluate the baseline of 2000-2004 for all fisheries (LL + TR)	OK	2*	Perform as a one-off sensitivity from HCR1 with a 5% constraint using a relative HCR input. Assuming HCRs are unadjusted from the current (output of 1 = 2000-2004). NOTE: if this were across all 7 MPs, this would be 8 science units. Catch-based MPs only. If also on effort, 6 science units are required.
	9. Add gear specific catch as additional performance indicators	OK	1	LL and TR as a total will be presented in the SPAMPLE tables only.
	10. Add catch and effort variability performance indicators under effort-based runs	Medium	3	As a request, effort variability includes effort-based runs only (linked to the WCPFC20 request above)
BET/YFT TRPs	17. Re-evaluate setting R2 BET 'miscellaneous fisheries' fishing to more recent levels	OK	8	Not requested by SC20. YFT R2 fishing may need to be in terms of effort. Implies re-running the 'nuclear grid'. Two recruitment scenarios to be evaluated.

Mixed fishery MSE framework

a. Target reference points for bigeye and yellowfin tuna

SC20	<p>1. SC20 recommended that the SSP include the following updates to SC20-MI-WP-07 for presentation to the Commission:</p> <ul style="list-style-type: none"> a. Update tables 2-7 with the equivalent depletion levels for South Pacific albacore based on the 2024 South Pacific albacore stock assessment; b. Include additional columns in the evaluation of candidate TRPs for YFT and BET which provide the impact on vulnerable biomass within the tropical longline fishery and the southern longline fishery. <i>(ref: SC20 Outcomes, paragraph 119)</i>
	<p>2. SC20 recommended that the SMD and Commission take into account the analysis contained in SC20-MI-WP-07 including the following when considering target reference points for bigeye and yellowfin tuna:</p> <ul style="list-style-type: none"> a. Based on the 2023 stock assessment for yellowfin, the miscellaneous fisheries are estimated to account for approximately 37% of the impact on the spawning potential over the period 2016-2018 (see Table 5 of WCPFC20-2023-16), but recent catch for yellowfin is higher. b. Based on the analysis in SC20-MI-WP-07, the CMM 2023-01 objectives for yellowfin and bigeye tuna cannot both be met simultaneously – if precisely achieved for one stock, the other will be above or below that level. <i>(ref: SC20 Outcomes, paragraph 120)</i>
	<p>3. SC20 recommended that an additional working paper be submitted to WCPFC21, which will include a re-evaluation of the candidate yellowfin and bigeye tuna TRPs using more recent fishing conditions for the domestic fisheries of Indonesia, Philippines, and Vietnam. The 2016-18 average catches are significantly lower than the recent fishing level, likely leading to a more optimistic projected stock status for yellowfin tuna. <i>(ref: SC20 Outcomes, paragraph 121)</i></p>
SMD02	<p>4. SMD02 expressed appreciation for the SSP presentation on the analyses to inform discussions on candidate bigeye and yellowfin TRPs (WCPFC-SMD02-2024-BP-04 and WCPFC-SMD02-2024-BP-05), which updated the analyses previously presented to WCPFC18 and concluded that the current objectives for these species cannot be simultaneously met at the exact level. <i>(ref: SMD02 Summary Report, paragraph 153)</i></p>
	<p>5. SMD02 expressed concern over the increase in yellowfin catches in Region 2, noting that these took place mainly in archipelagic waters excluded from the tropical tuna measure. SMD02 noted the request of SC20 for analysis from the SSP to be submitted to WCPFC21, which will include a re-evaluation of the candidate yellowfin and bigeye tuna TRPs using more recent fishing conditions for the domestic fisheries of Indonesia, Philippines, and Vietnam. SMD02 noted that the SSP expects to deliver the schedule of work for yellowfin tuna in the shaded area of Table 1 for WCPFC21. <i>(ref: SMD02 Summary Report, paragraph 154)</i></p>