Development of a Revised Tropical Tuna Measure Workshop 4
29 to 30 September 2023
Pohnpei, FSM, and online

SC19 Advice Relevant to CMM 2021-01

Prepared by the Secretariat

The purpose of this paper is to assist CCMs in considering SC19 advice that is relevant to the revisions to CMM 2021-01. It accompanies **WCPFC-TTMW4-2023-02** and sets out the entirety of the relevant paragraphs of advice and recommendations from the SC19 Outcomes Document that are referred to in that paper. For completeness, the requested SPC analyses are also included.

Table of CMM paragraphs proposed for revision according to the table of SSP requests from TTMW3 and/or SC19 advice
(The Table Includes detail on the paragraphs of relevant SC19 advice)

CMM Paras proposed by the Chair for revision	CCM Support	SPC Request Analysis and/or SC19 Advice Available Refer to SC19-MI-WP-08 Updates to table 9 of the evaluation of CMM 2021-01 for the review of CMM 2021-01
Preamble PP3 re SC advice	PNA+ US EU	SC19 advice: **SC19 stock assessment results on bigeye tuna (Paras 48 – 63, SC19 Outcomes Document)** a. **Stock Status and trends** 48. The 2023 WCPO bigeye tuna assessment provides stock status based upon a 54-model structural uncertainty grid with four axes: steepness with three levels, tag mixing period with two levels, and size and age composition data with three levels each, as illustrated in Table BET-01. **SC19 recommended that the proposed axes of uncertainty be accepted and that all models should be weighted equally**. The SC19 noted that an important improvement in the structural uncertainty grid was the inclusion of estimation uncertainty for each of the models in the grid. 49. SC19 noted that the most influential axes of uncertainty in the grid were steepness and tag mixing period. 50. The spatial structure used in the 2023 stock assessment is shown in Figure BET-01. Time series of total annual catch by fishing gear over the full assessment period is shown in Figure BET-02. The time series of total annual catch by fishing gear and assessment region is shown in Figure BET-03. Estimated annual spawning potential, average recruitment, and total biomass by model region is shown in Figure BET-04. Estimated trend in spawning biomass depletion ($SB/SB_{F=0}$) for the 54 models in the structural uncertainty grid is shown in Figure BET-05, and juvenile and adult fishing mortality rates from the diagnostic model is shown in Figure BET-06. Estimates of the reduction in spawning potential due to fishing by region are shown in Figure BET-07. A comparison of the dynamic MSY for the diagnostic model compared with annual catch by the main gear types are shown in Figure BET-08, and estimated age specific fishing mortality for the diagnostic model, by region and overall are in Figure BET-09. 51. SC19 noted that the preliminary estimate of total catch of WCPO bigeye tuna for 2022 was 140,664 mt which was similar to the 2021 level. Longline catch in 2022 (54,800 mt) was similar to the 2021 catch and lower than the recent ten-year average and understood to be partly due to the impacts of the COVID-19 pandemic. Purse-seine catch in 2022 (62,811 mt) was also similar to the 2021 catch, and lower than the recent ten-year average (Figure BET-02). 52. The 2023 WCPO bigeye tuna stock assessment median depletion from the model grid for the recent period (2018-2021; $SB_{recent}/SB_{F=0}$) was 0.35 (10th to 90th percentile interval of 0.30 to 0.40, including estimation and structural uncertainty, Table BET-02). For all models in the grid $SB_{recent}/SB_{F=0}$ was above the biomass limit reference point. The recent median fishing mortality (2017-2020; F_{recent}/F_{MSY}) was 0.59 (10th to 90th percentile interval of 0.46 to 0.74, including estimation and structural uncertainty, Table BET-02). For all models in the grid, F/F_{MSY} was less than one. 53. SC19 noted that the results show that the both total and spawning potential has been continuously declining since the late 1950s through until the mid-1970's, followed by a more gradual decline through to the present (Figure BET-04). 54. SC19 noted that the catch in the last year of the assessment (2021) was less than the median MSY (164,640 mt), which is a 17% increase in the estimated MSY for bigeye tuna from the 2020 stock assessment (140,720 mt). 55. Majuro (Figure BET-10) and Kobe (Figure BET-11) plots show that the stock status estimates across the 54 models are all within plot zones that indicate that the stock is not overfished nor undergoing overfishing. b. **Management advice and implications** 56. The objective for bigeye tuna in CMM 2021-01 (the Tropical Tuna Measure) — to maintain the spawning biomass depletion ratio at or above the average $SB/SB_{F=0}$ for 2012-2015 — is being achieved. $SB_{recent}/SB_{F=0}$ (35%) is very close to the average $SB/SB_{F=0}$ for 2012-2015 (34%) calculated across the unweighted grid. 57. The WCPO bigeye tuna spawning biomass is above the biomass LRP, and recent F is below F_{MSY} based on the uncertainty grid. The stock is very likely not experiencing overfishing (100% probability $F<F_{MSY}$) and is not in an overfished condition (0% probability $SB/SB_{F=0}<LRP$).

58.   SC19 also noted that average fishing mortality rates for juvenile and adult age-classes have increased throughout the period of the assessment (Figure BET-8), although more so for juvenile which have experienced considerably higher annual fishing mortality than adults (Figure BET-6). The purse-seine associated fishery has the most impact, with that of the miscellaneous and longline fisheries also notable (Figure BET-7). Higher fishing mortality rates on juvenile bigeye tuna reduces the realized yield per recruit for the bigeye fishery.

59.   SC19 noted that levels of fishing mortality and depletion differ among regions, and that fishery impact was higher in the tropical regions (Regions 3, 4, 7 and 8 in the stock assessment model), with particularly high fishing mortality on juvenile bigeye tuna in these regions.

60.   There is also evidence that the overall stock status is buffered with biomass and low exploitation in the temperate region (1, 2, 6 and 9) and most of the predicted movement is within the equatorial region. Exchange rates between temperate and tropical regions are estimated to be low.

61.   SC19 noted that the reduction of fishing mortality on fisheries that take juveniles could increase bigeye fishery yields and reduce any further impacts on spawning biomass of this stock. SC19 also noted that this could require considering the impact to other fisheries and stocks.

62.   The interim objective of bigeye tuna stock under CMM 2021-01 is to maintain the depletion level of the stock at or above the average $SB/SB_{F=0}$ for 2012-2015. The recent depletion level of bigeye tuna is close to this interim objective. SC19 noted that while the projection results based on the 2023 bigeye tuna assessment were not available for SC19 to review, this information will be available when for the 4th tropical tuna management workshop and will provide the Commission guidance on future expected levels of fishing mortality and the outcomes relative to the interim or future management objectives.

c.   Research Recommendations

63.   SC19 adopted several research recommendations for the further development and improvement of the WCPO bigeye tuna stock assessment, and suggested these be considered for potential inclusion in the Tuna Assessment Research Plan (TARP):
1) Continued collection of more representative biological data (e.g., age) and tagging data.
2) Develop additional CPUE index series testing key uncertainties about the analysis (e.g., regional vs. global model, classification of catchability vs. abundance covariates, etc.) and explore those as one-off sensitivities to the stock assessment.
3) Consideration of options to account for effort creep in CPUE standardization and/or the assessment model.
4) Simulation study to explore appropriate spatial structure of the stock assessment with a focus on simplifying the spatial structure (e.g., areas-as-fleets and/or 6 region structure) given the estimates of limited movement rates among regions.
5) Investigation of the 2023 model specifications leading to the exacerbated increase in unfished SSB over time for the tropical regions (3, 4, 7 and 8) compared to the 2020 stock assessment.
6) Yield per recruit analyses comparing fishery sectors with different selectivity patterns.
7) Evaluation of the variability and plausibility of estimated growth and mortality-at-age relationship across the structural uncertainty grid.
8) Additional one-off sensitivities exploring key uncertainties in biological assumptions, model specification, and data inputs (e.g., tag mixing, data weighting, and growth).
9) Identification of key parameters that are either highly correlated or highly sensitive to the jittering procedure to inform possible changes in model specification with the aim to decrease model complexity and/or sensitivity to starting conditions.
10) Exploration of seasonal and regional growth traits for the stock assessment.
11) Comprehensive review of the representativeness of the size composition data given conflicts identified in the likelihood profiles.
12) Investigation of the 2023 model specifications that lead to the inversion of the effect of the weight vs. tagging data signal on the total biomass, as shown in the likelihood profile.
13) Further exploration of the advantages and disadvantages of strategies to decrease model sensitivity to starting conditions, including but not limited to multi-start approaches.
14) Pursue development of tag mixing diagnostics and approaches, and investigate the impacts of tag mixing assumptions.

SC19 stock assessment results on yellowfin tuna (Paras 27 – 41, SC19 Outcomes Document)

a.   Stock status and trends

27.   The 2023 WCPO yellowfin tuna assessment provides stock status based upon a 54-model structural uncertainty grid with four axes: steepness with three levels, tag mixing period with two levels, and size and age composition data with three levels each, as illustrated in table YFT-01. **SC19 recommended that the proposed axes of uncertainty be accepted and that all models should be weighted equally. SC19 noted that an important improvement in the characterization of uncertainty was the inclusion of estimation uncertainty for each of the models in the grid.**

28.   SC19 noted that the most influential axis of uncertainty in the grid was steepness.

29.   The spatial structure used in the 2023 stock assessment is shown in Figure YFT-01. SC19 noted that the simplification of the model from 9 regions to 5 regions improved the convergence of the model.

30.	The time series of total annual catch by fishing gear over the full assessment period is shown in Figure YFT-02. The time series of total annual catch by fishing gear and assessment region is shown in Figure YFT-03. Estimated annual average recruitment, spawning potential, and total biomass by model region is shown in Figure YFT-04. Estimated trends in spawning potential depletion ($SB/SB_{F=0}$) for the 54 models in the structural uncertainty grid is shown in Figure YFT-05, and juvenile and adult fishing mortality rates from the diagnostic model is shown in Figure YFT-06. Estimates of the reduction in spawning potential due to fishing by region are shown in Figure YFT-07. Estimated trends in spawning potential for the 54 models are shown in Figure YFT-08. A Majuro and Kobe plot summarizing the results for each of the 54 models in the structural uncertainty grid are shown in Figure YFT-09. A comparison of the dynamic MSY for the diagnostic model compared with annual catch by the main gear types are shown in Figure YFT-10.

31.	SC19 noted that the preliminary estimate of total catch of WCPO yellowfin tuna for 2022 was 721,169 mt which was lower than the 2021 level. Longline catch in 2022 (84,232 mt) was higher than the 2021 catch, but lower than the recent 10-year average. Purse-seine catch in 2022 (379,715 mt) was similar to the 2021 catch, and higher than the recent 10-year average (Figure YFT-02).

32.	The 2023 WCPO yellowfin tuna stock assessment median depletion from the model grid for the recent period (2018–2021; $SB_{recent}/SB_{F=0}$) was estimated at 0.47 (10th to 90th percentile interval of 0.42 to 0.52, including estimation and structural uncertainty). For all models in the grid $SB_{recent}/SB_{F=0}$ was above the biomass limit reference point. The recent median fishing mortality (2017–2020; F_{recent}/F_{MSY}) was 0.50 (10th to 90th percentile interval of 0.41 to 0.62, including estimation and structural uncertainty, Table YFT-02). For all models in the grid, F/F_{MSY} was less than one.

33.	SC19 noted that the spawning potential of the stock has become more depleted across all model regions until around 2010, after which it has become more stable, or shown a slight increase.

34.	SC19 also noted that average fishing mortality rates for juvenile and adult age-classes have increased throughout the period of the assessment, although more so for juveniles which have experienced considerably higher fishing mortality than adults. In the recent period (2015-2021), a sharp increase in juvenile fishing mortality was estimated, while adult fishing mortality stabilized.

**b.	Management advice and implications**

35.	The WCPO yellowfin tuna spawning biomass is above the LRP and recent F is below F_{MSY} based on the uncertainty grid, The stock is not experiencing overfishing (100% probability $F<F_{MSY}$) and is not in an overfished condition (0% probability $SB/SB_{F=0}<LRP$).

36.	The objective for yellowfin tuna in CMM 2021-01 (the Tropical Tuna Measure) to maintain the spawning biomass depletion ratio at or above the average $SB/SB_{F=0}$ for 2012-2015 is being achieved. $SB_{recent}/SB_{F=0}$ (47%) exceeds the average $SB/SB_{F=0}$ for 2012-2015 (44% calculated across the unweighted grid).

37.	SC19 recommends stochastic projections based on the adopted yellowfin tuna grid be undertaken by the SSP and provided to the Commission for their consideration.

38.	The interim objective of yellowfin tuna stock under CMM2022-01 is to maintain the depletion level of the stock at or above the average $SB/SB_{F=0}$ for 2012-2015 and the recent depletion level of yellowfin tuna is close to the interim objective. SC19 noted that while the projection results based on the 2023 yellowfin tuna assessment were not available for SC19 to review, this information will be available when for the 4th tropical tuna management workshop and will provide the Commission guidance on future expected levels of fishing mortality and the outcomes relative to the interim or future management objectives.

39.	SC19 also noted a continuous downward trend in spawning potential ratio over the recent decade in Region 2 in the westernmost equatorial region, mainly due to the miscellaneous gear fisheries within this region, whereas other regions have been relatively stable over this period. This is the impact of artisanal (small-scale) fisheries other than longline and purse seine within this region. **SC19 recommends that the Commission note the need for clear limits for these.**

40.	SC19 also noted that there is evidence that the overall stock status is buffered with spawning biomass kept at a more elevated level overall by low exploitation in the temperate regions (1 and 5). The assessment model estimates spawning biomass to be divided between the tropical (59%) and temperate (41%) regions, but the vast majority of catch occurred in the tropical (94%) region.

**c.	Research recommendations**

41.	SC19 noted several research recommendations for the further development and improvement of the WCPO yellowfin tuna assessment:
a)	Exploration into the conflict between the length and weight composition data; if unresolved this conflict should be reflected within future structural uncertainty grids;
b)	Exploration of a simplification of the spatial structure by using a single area, with "areas-as-fleets";
c)	Exploration of alternative approaches to modeling of tagging data, including consideration of the most appropriate mixing periods for different regions and development of stand-alone tagging (mark-recapture) models;
d)	Exploration of which parameters are most sensitive to initial model starting values, and taking steps to reduce the impact of starting values on the results in future assessments; this could include simplification of models and/or systematic use of jittering;
e)	Further research to improve estimates of catches (both historical and recent) in the fisheries of Indonesia, the Philippines and Vietnam through the continued funding of the WPEA monitoring project;

		f) An exploration of seasonal and regional growth traits for the stock assessment; g) A study on longline CPUE standardization process considering effort creep; and h) Developing alternative CPUE scenarios with different implied regional weightings. **SC19 stock assessment results on skipjack tuna (Paras 66 – 73, SC19 Outcomes Document) – Update of 2022 skipjack tuna stock assessment information (Paras 68 and 69 of SC19 Outcomes Document)** 68. SC19 noted the results of SPC's work investigating technical issues highlighted by SC18 regarding the 2022 skipjack diagnostic model. 69. SC19 noted that the resulting updates to the diagnostic model for the WCPO skipjack assessment had negligible effect on the stock status and management advice from 2022.
Paras 11 – 13 Interim (objectives of BET, SKJ and YFT)	PNA+ US EU	SC19 advice: **HS and Interim Objectives for Bigeye Tuna (SC19 Outcomes Document, Paras 56 and 63)** 56. The objective for bigeye tuna in CMM 2021-01 (the Tropical Tuna Measure) — to maintain the spawning biomass depletion ratio at or above the average $SB/SB_{F=0}$ for 2012-2015 — is being achieved. $SB_{recent}/SB_{F=0}$ (35%) is very close to the average $SB/SB_{F=0}$ for 2012-2015 (34%) calculated across the unweighted grid. 63. The interim objective of bigeye tuna stock under CMM 2021-01 is to maintain the depletion level of the stock at or above the average $SB/SB_{F=0}$ for 2012-2015. The recent depletion level of bigeye tuna is close to this interim objective. SC19 noted that while the projection results based on the 2023 bigeye tuna assessment were not available for SC19 to review, this information will be available when for the 4th tropical tuna management workshop and will provide the Commission guidance on future expected levels of fishing mortality and the outcomes relative to the interim or future management objectives. **HS and Interim Objectives for Skipjack Tuna (SC19 Outcomes Document, Paras 130, 131 and 136)** 130. SC19 noted that the estimation method ran successfully and returned an estimate of $SB_{latest}/SB_{F=0}$ of 0.42, and that the corresponding scalar from the HCR was 1.0. Under the adopted MP outline in CMM 2022-01, this sets maximum effort in the purse seine and pole and line fisheries, and maximum catches in all other fisheries, at baseline levels (PS 2012 effort; PL 2001-04 effort; Region 5 domestic fisheries 2016-18 catches) for the subsequent management period (2024 to 2026). 131. Several CCMs noted that they were happy with this outcome, as it is consistent with the objective of relative stability in fishing levels between management periods. 136. **SC19 recommended that the Commission take into consideration the successful running of the skipjack MP as outlined in SC19-MI-WP-01 and its output, which sets maximum effort in the purse seine and pole-and-line fisheries and maximum catches in all other fisheries to their respective baseline levels for the period 2024-2026, when implementing CMM-2022-01.** **HS and Interim Objectives for Yellowfin Tuna (SC19 Outcomes Document, Paras 36 – 38)** 36. The objective for yellowfin tuna in CMM 2021-01 (the Tropical Tuna Measure) to maintain the spawning biomass depletion ratio at or above the average $SB/SB_{F=0}$ for 2012-2015 is being achieved. $SB_{recent}/SB_{F=0}$ (47%) exceeds the average $SB/SB_{F=0}$ for 2012-2015 (44% calculated across the unweighted grid). 37. SC19 recommends stochastic projections based on the adopted yellowfin tuna grid be undertaken by the SSP and provided to the Commission for their consideration. 38. The interim objective of yellowfin tuna stock under CMM 2022-01 is to maintain the depletion level of the stock at or above the average $SB/SB_{F=0}$ for 2012-2015 and the recent depletion level of yellowfin tuna is close to the interim objective. SC19 noted that while the projection results based on the 2023 yellowfin tuna assessment were not available for SC19 to review, this information will be available when for the 4th tropical tuna management workshop and will provide the Commission guidance on future expected levels of fishing mortality and the outcomes relative to the interim or future management objectives.
Paras 14, 15 (FAD Closure)	AS PNA+ Korea US EU	SPC analysis: Trade off between FAD closure period (EEZ/HS), and LL catch. Cf EEZ vs HS FAD closure, FAD closure and LL catch (table 9 of WCPFC-TTMW2-2021-01_rev4/ Tables 11-13 in WCPFC18-2021-15) SC19 advice: No specific advice is available from SC19 on FAD closure. For evaluation on FAD closure, refer to SC19-MI-WP-08 Updates to table 9 of the evaluation of CMM 2021-01. **5.2.1** Review of effectiveness of CMM-2021-01 (Paras 197 – 202, SC19 Outcomes Document: the following paragraphs are all that were endorsed by SC19 for the review of TTM) 197. SC19 noted that WCPFC 19 had agreed that the process to revise the Tropical Tuna Measure (TTM) will be based on CMM 2021-01 without a complete overhaul, and at least two workshops will be

		needed to make progress towards the adoption of a revised TTM in 2023. Based on the request to provide recommendations to the Commission on the effectiveness of CMM 2021-01, SC19 reviewed SC19-MI-WP-08 (*Updates to table 9 of the evaluation of CMM 2021-01*). 198. SC19 noted that SC19-MI-WP-08 evaluates the potential for CMM 2021-01 to achieve its objectives for each of the three WCPO tropical tuna (bigeye, yellowfin and skipjack) stocks. The current evaluations are based on the 2020 SC-agreed stock assessments for bigeye and yellowfin (last year of data is 2018) and the 2022 assessment for skipjack (last year of data is 2021). These evaluations now need to be updated to take account of the updated stock assessments for bigeye and yellowfin adopted by SC19 (last year of data is 2021) and the interim MP adopted for skipjack in 2022. 199. Several CCMs noted, that relative to the FAD set effort levels and the longline catches of bigeye and yellowfin, the TTM is performing adequately. However, as noted by the SSP in their previous evaluation presented at WCPFC19, since 2020 the evaluation of longline bigeye and yellowfin catches are below the expected range under the TTM. Additionally, the actual changes in catch relative to the 2016-2018 average baseline suggests the assumption of a direct relationship between the catch scalars may not be appropriate and may require further investigation. 200. SC19 supported the current analysis framework described in SC19-MI-WP-08. However, it queried as to how the 30-year projections used in the analyses will account for the effort levels in the skipjack fishery now being set every three years based on the adopted interim MP, as implementing the MP would reduce catch if stock biomass decreased. The SSP noted that while this needs to be finalised, these projections just present alternative scenarios that bound future levels between optimistic and fully utilised scenarios. 201. SC19 noted that the SSP is planning to have the updated projections ready for the TTMW4 in September. The updated evaluations will include an update to the baseline period which will now be 2019-2021. The SSP also explained that the preliminary FAD set scalar of 1.19 for the purse seine fisheries in the fully-utilised conditions, is the ratio of effort in 2012 divided by the effort in the period 2019-2021. 202. **SC19 recommended that the updates to SC19-MI-WP-08 be forwarded to both TTMW4 and the Commission for their consideration in reviewing the Tropical Tuna Measure**.
Paras 14, 15	as above	SPC analysis: Include stock projections for different scenarios of reduced FAD closure (10% 20%, 30% reduction, status quo) in their analyses to be presented to SC19. SC19 advice: No specific advice on this issue from SC19. However, SC19-MI-WP-08 should be referred for assessments/evaluations on relevant issues.
Paras 14, 15	as above	SPC analysis: Include stock projections for different scenarios of increased FAD closure (10%, 20%, 30% increase) in their analyses. SC19 advice: No specific advice on this issue from SC19. However, SC19-MI-WP-08 should be referred for assessments/evaluations on relevant issues.
Paras 14, 15	as above	SPC analysis: What is the impact to juvenile BET and YFT from decreasing the FAD closure period in terms of $SB/SB_{F=0}$? SC19 advice: Refer to the text above and further note that the updates to SC19-MI-WP-08 be forwarded to both TTMW4 and the Commission for their consideration in reviewing the Tropical Tuna Measure. SC19 has no specific recommendations on this as BET and YFT stock assessments have just been accepted by SC19, analysis on this will be conducted by SSP after SC19 using the 2023 BET and YFT assessment and expected to be available at TTMW4 and/or the Commission.
Paras 14, 15	as above	SPC analysis: Examine the implications of the FAD closure on foregone catches of SKJ and YFT SC19 advice: SC19 has no specific recommendations on this as BET and YFT stock assessments have just been accepted by SC19, analysis on this will be conducted by SSP after SC19 using the 2023 BET and YFT assessment and is expected to be available at TTMW4 and/or the Commission.
Paras 14, 15	as above	SPC analysis: Identify the biomass depletion levels associated with various candidate TRPs (i.e., 2012-2015 depletion, 2004 depletion, depletion associated with a risk level, 2001-2004 average levels), and the LL/PS scalars that achieve those biomass depletion levels. SC19 advice: SC19 has no specific recommendations on this as BET and YFT stock assessments have just been accepted by SC19, analysis on this will be conducted by SSP after SC19 using the 2023 BET and YFT assessment and is expected to be available at TTMW4 and/or the Commission.
Paras 14, 15	as above	SPC analysis: Examine the conditions necessary to achieve a BET TRP at 2012-15 depletion levels, where the FAD closure has been removed

		SC19 advice: SC19 has no specific recommendations on this as BET and YFT stock assessments have just been accepted by SC19, analysis on this will be conducted by SSP after SC19 using the 2023 BET and YFT assessment and is expected to be available at TTMW4 and/or the Commission.
Paras 14, 15	as above	SPC analysis: Update Tables 9 and 10 of WCPFC18-2021-15 based upon the new assessment SC19 advice: Refer to SC19-MI-WP-08
Paras 14, 15	as above	SPC analysis: Provide an updated analysis on the potential level of high seas purse seine effort based on the SKJ TRP (SKJ MP output). SC19 advice: Refer to Para 137, SC19 Outcomes Document: 137. SC19 recommended that the Commission take into consideration the successful running of the skipjack MP as outlined in SC19-MI-WP-01 and its output, which sets maximum effort in the purse seine and pole-and-line fisheries and maximum catches in all other fisheries to their respective baseline levels for the period 2024-2026, when implementing CMM-2022-01. But an updated analysis on the potential level of high seas purse seine effort based on the SKJ TRP (SKJ MP output) is expected to be available at TTMW4 and/or the Commission.
Paras 14, 15	as above	SPC analysis: Table with future purse seine scalars under current conditions, without footnote 1 exemptions, without paragraph 15 exemptions (previous paragraph 17), without HS effort by CCMs in table 2, without HS effort by CCMs not in table 2 SC19 advice: Refer to SC19-MI-WP-08
Paras 14, 15	as above	SPC analysis: Update of Tables 14 and 15 of WCPFC19-2021-15, with the updated TRP from the interim skipjack MP for the reference periods 2012, 2016-2018 and 2018-2021 SC19 advice: Refer to SC19-MI-WP-08
Paras 14, 15	as above	SPC analysis: Updated figures 9 and 10 of SC18-MI-IP08 with PS effort in waters under national jurisdiction (EEZs and AWs), in the HS by CCMs in table 2 of CMM, in the HS by the Philippines, in the HS by Pacific Island fleets fishing in high seas adjacent to their home waters during the HS closures, in the HS by CCMs not listed in Table 2 (not including the effort already included in update of data summaries). SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Paras 14, 15	as above	SPC analysis: Update Table 6 and 7 of WCPFC18-2021-15 with a TRP at 2012-15 levels, without a FAD closure. SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4
Paras 17, 18, 19, 20	PNA+ US EU	SC19 advice: *The following paragraphs in this cell and the next cell (paragraphs 205 – 223) are all related to the review on FADs by SC19.* **6.2 FAD Impacts** (SC19 Outcomes Document, Paras 205 – 215) **6.2.1 Research on non-entangling and biodegradable FADs (Project 110)** 205 SC19 noted that limited information on dFAD designs and materials is available from 2020 to 2023 due to low observer coverage, and there is a need for additional data fields or more systematic data to be recorded to adequately assess the designs, materials, and type of dFADs deployed in the WCPO. 206 **SC19 recommended that further studies are implemented to quantify the effectiveness and the entanglement frequency of Species of Special Interest (SSI) in the WCPO on dFAD designs, including Low Entanglement Risk dFADs, Non-Entangling dFADs and Biodegradable dFADs.**

207   To help reduce marine pollution and ecosystem impacts linked to the use of dFADs, SC19 promotes the reduced use of plastics and non-biodegradable materials in the construction of dFADs and the use of non-entangling FADs, as required from CMM 2021-01 and implemented beginning in January 2024.

208   SC19 noted the delays in the activities from Project 110 due to the COVID-19 pandemic and updated timing of activities, and supported the no-cost project extension with a final anticipated report to be presented at SC21 in 2025.

209   SC19 highlighted the importance of the on-going research activities led by SPC and ISSF, in collaboration with fishing industry, to trial non-entangling and biodegradable dFADs in the WCPO to inform implementation of the requirements under CMM 2021-01. SC19 supported the TOR for a follow-up project to enhance SC Project 110 by trialling additional non-entangling and biodegradable dFADs and to investigate alternative construction locations and locally sourced materials.

210   SC19 supports CCMs to encourage their purse seine vessels to participate in trials of biodegradable FADs of Category I and II (all FAD components are biodegradable except for flotation devices and GPS buoy).

6.2.2   FAD Management Options IWG Issues

211   **SC19 recommended that the FADMO-IWG and TCC review the timelines for the stepwise introduction of biodegradable dFADs considering the expected outcomes of projects related to the design, cost-effectiveness and performance of biodegradable dFADs (e.g., jelly FADs) in the WCPO and other oceans.**

212   SC19 viewed that moving to biodegradable FADs is important for reducing marine pollution and other impacts. However, SC19 noted that it is challenging for some CCMs, especially for purse seine operators that are going through a major process of eliminating netting in FADs, to meet the non-entangling requirement for 2024 and further noted that trials for biodegradable FADs are still ongoing. In this regard SC19 noted that, for some CCMs, the year 2025 to start the transition to biodegradable FADs implementation may not be viable.

213   SC19 noted IATTC's biodegradable FAD implementation program, which includes timelines with the mandatory use of categories I to IIIb by 2026 (Table FAD-1); and categories I to II by 2029, which could be reviewed by TCC and the FADMO IWG for consideration in the WCPO.

TABLE FAD-1: Preliminary categories of drifting FADs biodegradability levels (from non-biodegradable to 100% biodegradable) for the gradual implementation of biodegradable drifting FADs. *In year X, FADs of either category III(a) (biodegradable tail) or/and category III(b) (biodegradable raft) are required/implemented simultaneously.*

Categories[1]	Potential Timeline (Suggestion 1)	Potential Timeline (Suggestion 2)	Remarks
Category I. The FAD is made of 100% biodegradable materials.	Year X + 3	Year X + d	Year X will be determined by the WCPFC and subject to review based on available information and availability of materials
Category II. The FAD is made of 100% biodegradable materials except for plastic-based flotation components (e.g., plastic buoys, foam, purse-seine corks).	Year X + 2	Year X + c	Year X will be determined by the WCPFC and subject to review based on available information and availability of materials
Category III(a). The subsurface part of the FAD is made of 100% biodegradable materials, whereas the surface part and any flotation components contain non-biodegradable materials (e.g., synthetic raffia, metallic frame, plastic floats, nylon ropes).	Year X	Year X +b	Year X will be determined by the WCPFC and subject to review based on available information and availability of materials
Category III(b). The subsurface part of the FAD contains non-biodegradable materials, whereas the surface part is made of 100% biodegradable materials, except for, possibly, flotation components.	Year X	Year X +a	Year X will be determined by the WCPFC and subject to review based on available information and availability of materials
Category IV. The surface and subsurface parts of the FAD contain non-biodegradable materials.	Current	Year X	

Note* These definitions do not apply to electronic buoys attached to FADs to track them.

214.   **SC19 recommended the FADMO IWG and TCC consider incentivising the use of biodegradable dFADs.**

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[1] The Categories were renumbered as follows: Category III = Category III(a); Category IV = Category III(b) and Category V = Category IV

		215. SC19 noted that some CCMs suggested one example of an incentive could be to allow biodegradable dFADs to be deployed during the FAD closure.
Paras 21, 22, 23	PNA+ Korea US EU	SC19 advice: **Instrumented Buoys** (Paras 216 – 222, SC19 Outcomes Document) 216. SC19 noted the limitation in the scientific analyses of FAD tracking data due to the current incomplete data. SC19 noted the importance of complete FAD tracking data, including for historical periods, to support scientific analyses to detect trends in dFAD use; to evaluate the effectiveness of paragraph 21 of the Tropical Tuna Measure (CMM 2021-01); to determine the origin of FADs and buoys found stranded; and to explore spatial management options to reduce stranding events. 217. SC19 supported the suggestion of the FADMO IWG on requiring the provision of the daily location records from buoys attached to dFADs to be provided, including historical periods, with research organizations (SPC), with research organizations within CCMs, or with the Commission 218. SC19 noted that, based on the information available, no vessel monitored more than 350 active buoys per day (the current buoy number limit under CMM 2021-01), with 90% of the vessels monitoring less than 130 buoys per day. It was noted these results were limited to the fleets that have provided tracking information since January 2023 and some differences for at least one fleet have been noted. **SC19 recommended that the FADMO IWG and TCC further discuss the active FAD buoy limit and provide advice to TTMW4 and the Commission on this issue**. 219. **SC19 recommended that options should be developed by the FADMO IWG and TCC for reporting the number of active buoys per vessel (paragraph 21 of CMM 2021-01); and to develop processes to i) report the number of dFADs and buoys deployed and retrieved per year; ii) report lost and abandoned dFAD; and iii) to eventually abandon and deactivate buoy communication (paragraph 22 of CMM 2021-01).** 220. SC19 highlighted the need for in-situ data collection to better quantify FAD stranding events and the impacts of FADs on marine and coastal environments; and encouraged **the expansion of the in-country stranded FAD data collection programs to other CCMs.** 221. **SC19 highlighted the need to promote FAD retrieval, preferably by the owner of the buoy attached, and eventually through dedicated programs, before FADs are abandoned or lost and ultimately reach coastal areas. SC19 recommended that options for increased FAD detection and retrieval should be considered, including economic aspects and standards required for programs to be effective. SC19 recommended that a FAD recovery program/strategy be an agenda item for the FADMO IWG.** 222. **SC19 supported the Pacific-wide collaboration** on dFAD research, in particular on harmonising data collection processes, increasing non-confidential data exchanges and collaborating on data analyses.
Paras 24 – 27, Tables 1 & 2	AS PNA+ PH Japan US	SPC analysis: Produce the usual depletion/risk matrices (nuclear grid) for BET and YFT based on LL and PS scalers using the 2023 assessment grids. SC19 advice: Refer to SC19-MI-WP-08 and an update is expected for the TTMW4.
Paras 24, 25 Table 2	as above	SPC analysis: Examine the conditions necessary to achieve a BET TRP at 2012-15 depletion levels, where the FAD closure has been removed SC19 advice: Refer to SC19-MI-WP-08 and, as BET and YFT stock assessments have just been accepted by SC19, further analyses on this will be conducted by SSP after SC19 using the 2023 BET and YFT assessment and is expected to be available at TTMW4 and/or the Commission.
Paras 25-27; Table 2	as above	SPC analysis: Provide an updated analysis on the potential level of high seas purse seine effort based on the SKJ TRP (SKJ MP output). SC19 advice: Refer to Para 137, SC19 Outcomes Document: 137. SC19 recommended that the Commission take into consideration the successful running of the skipjack MP as outlined in SC19-MI-WP-01 and its output, which sets maximum effort in the purse seine and pole-and-line fisheries and maximum catches in all other fisheries to their respective baseline levels for the period 2024-2026, when implementing CMM-2022-01.
Paras 25-27; & Table 2	as above	SPC analysis: Table with future purse seine scalars under current conditions, without footnote 1 exemptions, without paragraph 15 exemptions (previous paragraph 17), without HS effort by CCMs in table 2, without HS effort by CCMs not in table 2 SC19 advice: Refer to the text above related to the Review of the Effectiveness of CMM 2021-01 and further note that the updates to SC19-MI-WP-08 be forwarded to both TTMW4 and the Commission for their consideration in reviewing the Tropical Tuna Measure.
Paras 25-27, Table 2	as above	SPC analysis: Update of Tables 14 and 15 of WCPFC19-2021-15, with the updated TRP from the interim skipjack MP for the reference

		periods 2012, 2016-2018 and 2018-2021 SC19 advice: As noted by SC19 the successful running of SKJ MP, refer to SC19-MI-WP-08 and its updates that is expected to be available at TTMW4 and/or the Commission.
Table 2	as above	SPC analysis: Provide information to support inclusion of the catch by the Philippines in the high seas limit and how this could be implemented. SC19 advice: Refer to SC19-MI-WP-08 and its updates be forwarded to TTMW4 and the Commission.
Paras 24 Table 1	as above	SPC analysis: Update Table 6 and 7 of WCPFC18-2021-15 with a TRP at 2012-15 levels, without a FAD closure SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Tables 1 & 2	as above	SPC analysis: Updated figures 9 and 10 of SC18-MI-IP08 with PS effort in waters under national jurisdiction (EEZs and AWs), in the HS by CCMs in table 2 of CMM, in the HS by the Philippines, in the HS by Pacific Island fleets fishing in high seas adjacent to their home waters during the HS closures, in the HS by CCMs not listed in Table 2 (not including the effort already included in update of data summaries). SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Paras 24, 25, Table 2	as above	SPC analysis: Develop methods to convert between purse seine effort and longline catch. What does a day of fishing and sets of fishing equate to in terms of catch- both on the high seas and inside EEZs. (note also para 136 of TTMW3-2023-IP02) SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Para 37, Table 3	FFA PNA+ Korea US EU	SPC analysis: Produce the usual depletion/risk matrices (nuclear grid) for BET and YFT based on LL and PS scalers using the 2023 assessment grids. SC19 advice: SC19 has no specific recommendations on this as BET and YFT stock assessments have just been accepted by SC19, analysis on this will be conducted by SSP after SC19 using the 2023 BET and YFT assessment and is expected to be available at TTMW4 and/or the Commission.
Para 37, Table 3	as above	SPC analysis: Identify the biomass depletion levels associated with various candidate TRPs (i.e., 2012-2015 depletion, 2004 depletion, depletion associated with a risk level, 2001-2004 average levels), and the LL/PS scalars that achieve those biomass depletion levels. SC19 advice: Refer to the text above related to the Review of the Effectiveness of CMM 2021-01 and further note that the updates to SC19-MI-WP-08 be forwarded to both TTMW4 and the Commission for their consideration in reviewing the Tropical Tuna Measure.
Paras 37 Table 3	as above	SPC analysis: Analysis of catch, effort, and catch-per-unit-effort (in weight per day) by zone and high seas, for longline fisheries and fleets SC19 advice: Refer to SC19-MI-WP-08 and, as BET and YFT stock assessments have just been accepted by SC19, updates is expected to be available at TTMW4 and/or the Commission.
Paras 37	as above	SPC analysis: Update Tables 9 and 10 of WCPFC18-2021-15 based upon the new assessment SC19 advice: Refer to SC19-MI-WP-08 and, as BET and YFT stock assessments have just been accepted by SC19, updates is expected to be available at TTMW4 and/or the Commission.
Para 37, Table 3	as above	SPC analysis: Develop methods to convert between purse seine effort and longline catch. What does a day of fishing and sets of fishing equate to in terms of catch- both on the high seas and inside EEZs. (note also para 136 of TTMW3-2023-IP02) SC19 advice:

		SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Paras 37 Table 3	as above	SPC analysis: Update Table 6 and 7 of WCPFC18-2021-15 with a TRP at 2012-15 levels, without a FAD closure SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Para 52	PNA+ US	n/a
Attachment 2		SPC analysis: Provide information to support inclusion of the catch by the Philippines in the high seas limit and how this could be implemented. SC19 advice: Refer to the SC19-MI-WP-08 and updates may be made available at the TTMW4.
Attachment 2		SPC analysis: Updated figures 9 and 10 of SC18-MI-IP-08 with PS effort in waters under national jurisdiction (EEZs and AWs), in the HS by CCMs in table 2 of CMM, in the HS by the Philippines, in the HS by Pacific Island fleets fishing in high seas adjacent to their home waters during the HS closures, in the HS by CCMs not listed in Table 2 (not including the effort already included in update of data summaries). SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
All		SPC analysis: Update of data summaries as in SC18-MI-IP-08 – LL catch and PS/PL effort by area (AW, EEZ, HSP, other HS) and HS v flag) SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Other paras CCMs proposed for revision	**CCM Support**	**SPC Request Analysis and/or SC19 Advice Available**
Preamble, PP2, SKJ MP	EU US	Proposed revisions: n/a
Para 1	EU	SKJ MP reference: n/a
Para 4	EU	SPC analysis: Updated figures 9 and 10 of SC18-MI-IP08 with PS effort in waters under national jurisdiction (EEZs and AWs), in the HS by CCMs in table 2 of CMM, in the HS by the Philippines, in the HS by Pacific Island fleets fishing in high seas adjacent to their home waters during the HS closures, in the HS by CCMs not listed in Table 2 (not including the effort already included in update of data summaries). SC19 advice: SC19 has no specific recommendations on this as SSP will conduct this analysis after the TTMW4.
Para 24	Japan	Revisions: n/a
Para 41 bis	PNA+ US	Monitoring and control LL fishery: n/a
Para 41 ter	EU	Catch retention: LL n/a
Paras 44, 45	EU	"Targeting": n/a
Para 47	PNA+ US EU	SC advice on Indonesia's handline fishery SC19 provided no specific recommendations on this.
Attachment 2	PH	See above