SCIENTIFIC COMMITTEE
SIXTEENTH REGULAR SESSION

ELECTRONIC MEEETING
11-20 August 2020

ISSUES ARISING FROM THE COMMISSION
(SC15 and WCPFC16)

WCPFC-SC16-2020/GN-IP-05

WCPFC Secretariat and SPC-OFP

ISSUES ARISING FROM SC15 (Report paragraphs indicated below)		
Issues	**References**	**Outputs/Comments**
Overview of WCPO fisheries	38. SC15 recommended that future versions of the SC15-GN-WP-01 paper include: • summaries of northern stocks in the WCPFC Convention Area; and • more information on the "other" fisheries.	SC16-GN-IP-01 (Overview of tuna fisheries in the WCPO, including economic conditions – 2019)
Data gaps	70. SC15 requested that SPC provide an update to TCC15 on the issues raised in SC15-ST- WP-01.	WCPFC-TCC15-2019-IP03_rev1 (Scientific data available to the Western and Central Pacific Fisheries Commission (WCPFC-SC15-ST-WP01_rev1) - revision 1)
	71. SC15 recommended that the charter notification issues raised in SC15-ST-WP-01 be taken into account in the review leading to the new/replacement Charter Notification CMM. For example, when the coverage of operational data submitted is not 100% and chartered vessels for that flag state have been notified to the Commission, then the flag state shall submit a list of vessels representing the catches compiled for their annual catch estimates and aggregate catch/effort data (with these data submissions).	This concern will be considered when amendments are made (see SC16-ST-WP-01).
	72. SC15 recommended that the WCPFC Scientific Services Provider make the following enhancements to the tables on longline observer coverage in the Regional Observer Programme (ROP) data management paper (SC15-ST-IP-02) in the future: a) Separate the observer coverage of domestic CCM fleets active in their home EEZ (non-ROP coverage), where such information is voluntarily	SC16-ST-IP-02 (Status of observer data management) WCPFC-TCC15-2019-IP04_rev2 (Status of Observer Data Management (updated version of SC15-ST-IP02 paper)_revision 2)

<table>
<tr><td></td><td>provided from a CCM, from the observer coverage of CCM fleets fishing outside their home EEZ (ROP coverage);
b) List all (ROP and non-ROP) longline observer coverage for each fleet based on HOOKS or SETS as measured by WCPFC data submissions. This information is intended to provide estimates of total longline observer coverage in the WCPFC Area for reference, and will not be used for compliance purposes. The WCPFC Scientific Services Provider will provide an update to TCC15 for CCM review.
c) Include a column to describe the coverage of longline E-Monitoring data in the table of longline E-Monitoring coverage based on FISHING DAYS or SETS.</td><td></td></tr>
<tr><td></td><td>73. SC15 acknowledged the cannery data submissions (representing ~37% of the tropical WCPFC purse seine catch in recent years) to the WCPFC by International Seafood Sustainability Foundation (ISSF) participating companies, and the potential of cannery data for the work of the Commission, specifically Project 60. SC15 recommended that the WCPFC Scientific Services Provider (with assistance from the WCPFC Secretariat) investigate what Commission mechanisms could be used and/or updated to facilitate the voluntary submission, and ensure an appropriate level of confidentiality, of cannery data from other processors for future Commission work (Project 60), and report the findings to SC16.</td><td>SC16-ST-IP-03 (An update on cannery data with potential use to the WCPFC)</td></tr>
<tr><td></td><td>74. SC noted the recurrent difficulties of the WCPFC Scientific Services Provider to reconcile the discrepancies between the number of trips and observer appointments in Tables 1 and 2 of SC15-ST-IP-02 and recommended that the WCPFC Scientific Services Provider and WCPFC Secretariat investigate how these discrepancies could be addressed, in view to facilitating the work of SC and TCC.</td><td>SC16-ST-IP-02 (Status of observer data management)</td></tr>
<tr><td>Species composition of purse-seine catches (Project 60)</td><td>91. SC15 recommended that the following activities be considered under Project 60 over the coming year, with the outcomes reported to SC16:
<table><tr><th>Activity</th><th>Priority</th></tr><tr><td>1. Paired grab-spill trips (target: 4 to 6):
• Targeting fleets with likely availability of comprehensive landings slips data (to be provided on a voluntary basis).
• Additional data should allow for improved estimates of bias correction factors, and provide a more powerful dataset for testing for species and/or school association specific correction factors</td><td>High</td></tr><tr><td>2. Continue to explore opportunities for collaboration with members, specifically undertaking comparisons of observer samples, and potentially model-based, species composition estimates, with accurate unloadings / landings / cannery data</td><td>High</td></tr><tr><td>3. Investigation of video-based sampling for estimation of species and size compositions</td><td>Medium</td></tr><tr><td>4. Simulation model
• Exploration of potential bias from between-brail variability in size
• Inform need for set and/or species-specific correction factors</td><td>Medium</td></tr><tr><td>5. Cost-benefit analysis of alternative sampling approaches for long-term estimation of species compositions (i.e. at-sea sampling vs port sampling)</td><td>Low</td></tr></table></td><td>SC16-ST-IP-04 (Project 60: Progress Report)

SC16-ST-IP-05 (USA purse seine catch composition)</td></tr>
</table>

	92. SC15 recommended that the following changes (as outcomes from Project 60) be incorporated into the process for generating the aggregated purse seine species catch estimates in the future: • Multinomial-model based correction factors be used to correct existing and future grab sample data, rather than the estimates of 'availability'; • The beta-response models be used to generate catch estimates; and, • Observer samples are stratified by flag when used to directly estimate species compositions.	SC16-ST-IP-01 (Estimates of annual catches in the WCPFC statistical area) SC16-ST-IP-04 (Project 60: Progress Report) SC16-SA-IP-18 (Analysis of purse seine and longline size frequency data for bigeye and yellowfin tuna in the WCPO)
	93. SC15 acknowledged the recent work on the potential of EM to enhance the collection of scientific data (size and species composition) onboard purse seine vessels, potentially freeing the observer to concentrate on other duties. Additional work in support of the proposed Project 60 work plan for August 2019 onwards was proposed. SC15 recommended the outcomes of any further work be reported to SC16.	SC16-ST-IP-04 (Project 60: Progress towards achieving SC15 recommendations) SC16-ST-IP-07 (Report of the DCC meeting for the review of Longline E-Monitoring data fields) SC16-ST-IP-08 (ER and EM implementation progress in the region SC16-ST-IP-09 (Comparing Electronic Monitoring and human observer collected fishery data in the tropical tuna purse seine operating in the Western and Central Pacific Ocean)
Better size data (length and weight) for scientific analyses (Project 90)	96. SC15 recommended that the WCPFC Scientific Services Provider proceed to coordinate the activities proposed for Project 90 for the coming year (as listed in Annex 2 of SC15-ST-WP-03) and report the progress to SC16.	SC16-ST-IP-06 (Project 90 update: Better data on fish weights and lengths for scientific analyses)
Project 93 (Review of the Commission's data needs and collection programmes)	103. SC15 recognised the usefulness of the work conducted to date under Project 93 and recommended the WCPFC Secretariat prepare and distribute a circular drawing attention to the tables in SC15-ST-WP-04, following their discussion by the ISG-02, requesting CCMs provide further feedback prior to TCC15, when it will be further discussed.	WCPFC Circular 2019/48 (Request for Comments on Tables Summarizing the Commission's Data Needs and Collection Programmes (SC Project 93)) WCPFC-TCC15-2019-14 (SC project 93 report to TCC15 (update of paper SC15-ST-WP-04)) SC16-ST-IP-07 (Report of the DCC Meeting for the Review of Longline Electronic Monitoring (EM) Data Fields) is an example of progressing the philosophy of Project 93
Economic data	114. SC15 considered the development of guidelines for the voluntary provision of economic data to the Commission and recommended that intersessional work be undertaken to further develop the draft guidelines as provided in SC15-ST-WP-05 and provide guidance on appropriate ways to address issues raised. CCMs wishing to participate in this intersessional work should provide a contact point	WCPFC Circular 2019/58 (Intersessional Working Group to Further Develop Guidelines for the Voluntary Provision of Economic Data to the Commission) • Further consideration on this issue was

	for inclusion in this intersessional working group which will be facilitated by Fiji and the FFA Secretariat. SC15 further recommended that the outcomes of this intersessional work be considered by SC16.	deferred.
Comprehensive review of Commission reporting requirements	121. SC15 noted SC15-ST-WP-06 *Streamlining WCPFC reporting requirements – discussion paper* that was introduced by the Secretariat. Noting that a finalised version of the paper will be submitted to TCC15 for decisions on recommendations on the way forward to WCPFC16, SC15 encouraged interested CCMs and observers to submit views on the discussion paper to the Secretariat no later than Wednesday 28th August 2019.	WCPFC-TCC15-2019-10 (Streamlining WCPFC Reporting Requirements - discussion paper - a TCC Workplan 2019-2021 project related to the WCPFC Compliance Monitoring Scheme) Publishing of the ACE tables at https://www.wcpfc.int/ace-by-fleet SC16-GN-IP-07 (Update on streamlining annual reporting initiatives)
Bigeye tuna research	147. SC15 reviewed progresses for the research recommendations from SC14 for bigeye growth and noted that the following research issues need to be addressed further, after classifying these research items as short-term (preferably before SC16) and long-term (preferably before the scheduled 2023 stock assessment). a) Develop MULTIFAN-CL functionality that can accommodate spatial variation in growth rates and movement between western and eastern Pacific to consider the appropriateness of delineating the two stocks at 150˚W (long-term). b) Carry out further otolith age validation studies for fish in the western and central Pacific. Consider chemically marking fish at release in future tagging programs and then analyzing otoliths from recaptured marked fish (long-term). Apply other age validation methodology including radiocarbon age validation (short to long-term). SC15 noted potential issues of the spatial pattern of radiocarbon in the Pacific Ocean and its implications for mobile adult tuna. c) Continue to develop and document protocols for daily and annual ageing by IATTC and WCPFC (short-term). d) Continue efforts under Project 94 to collect very small bigeye caught by the Indonesian, Vietnamese, and Philippines domestic fisheries in region 7 to aid in the estimation of the size at age-1 qtr-1 parameter (L1) within the assessment model (short to long-term). e) Compile a high confidence tagging dataset for growth analysis and develop integrated growth models incorporating the tagging data and the otolith data (short-term). f) Conduct sensitivity analysis using alternative growth models in the stock assessment, if new growth models are developed such as an integrated growth model (short -term), a conditional age-at-length growth model (short-term), and other growth models after conducting further growth analysis listed above.	SC16-SA-IP-01 (Development in the MULTIFAN-CL software 2019-20) SC16-SA-IP-15 (Preliminary analyses for a Close Kin Mark Recapture feasibility study in WCPO) SC16-SA-IP-03 (Integrated growth models from otolith and tagging data for yellowfin and bigeye tuna in the western and central Pacific Ocean) SC16-SA-WP-02 (Age and growth of yellowfin and bigeye tuna in the western and central Pacific Ocean from otoliths) SC16-SA-WP-03 (Stock assessment of bigeye tuna in the western and central Pacific Ocean) SC16-SA-IP-06 (Background analyses for the 2020 stock assessments of bigeye and yellowfin tuna in the western and central Pacific Ocean) SC16-SA-IP-14 (The application of genetics and genomics to Pacific fisheries by SPC and implications for the WCPFC Tuna Tissue Bank) SC16-SA-IP-17 (Report on the bomb radiocarbon age validation workshop for tuna and billfish in the WCPO)

	g) Undertake a genetic stock structure analysis (long-term).	SC16-SA-IP-18 (Analysis of purse seine and longline size frequency data for bigeye and yellowfin tuna in the WCPO)
Yellowfin tuna	162. SC15 encouraged the continuation of project 82 on yellowfin tuna age and growth for the next stock assessment. 163. SC15 noted that the following research issues need to be addressed for yellowfin tuna after classifying these research items as short-term (preferably before SC16) and long-term (preferably before the scheduled 2023 stock assessment). a) Carry out further otolith age validation studies for yellowfin in the western and central Pacific such as applying radiocarbon age validation (short to long-term). b) Compile a high confidence tagging dataset for growth analysis and develop an integrated growth model incorporating the tagging data and the otolith data (short-term). c) Continue to develop and document protocols for daily and annual ageing by IATTC and WCPFC (short-term).	SC16-SA-WP-02 (Age and growth of yellowfin and bigeye tuna in the western and central Pacific Ocean from otoliths) SC16-SA-IP-03 (Integrated growth models from otolith and tagging data for yellowfin and bigeye tuna in the western and central Pacific Ocean) SC16-SA-WP-04 (Stock assessment of yellowfin tuna in the western and central Pacific Ocean) SC16-SA-IP-06 (Background analyses for the 2020 stock assessments of bigeye and yellowfin tuna in the western and central Pacific Ocean)
Skipjack tuna	222. The skipjack interim Target Reference Point (TRP) is 50% of spawning biomass in the absence of fishing. The trajectory of the median spawning biomass depletion indicates a long-term trend, and has been under the interim TRP since 2009 (i.e., for 10 years). Since the median spawning biomass has been consistently below the interim TRP, SC15 recommends that the Commission take appropriate management action to ensure that the biomass depletion level fluctuates around the TRP (e.g., through the adoption of a harvest control rule).	The skipjack HCR was not yet adopted. WCPFC16-2019-14 (Current and projected stock status of WCPO skipjack tuna to inform consideration of an updated target reference point (update of SC15-SC16-MI-IP-09/MOW3-WP-03)) WCPFC16-2019-16 (Results of Initial Evaluations of Management Procedures for Skipjack (update of SC15-SC16-MI-WP-05)) SC16-MI-WP-02 (Updates to WCPO skipjack tuna projected stock status to inform consideration of an updated target reference point)
	223. In order to maintain the quality of stock assessments for this important stock SC15 recommends: a) continuing work to develop an index of abundance based on purse seine data and from FAD acoustic sensors; b) evaluating the possibility of conducting fishery independent surveys to provide relative abundance indices; c) conducting regular large-scale tagging cruises and expanding the infrastructure for rapid return of recaptured tags in a manner that provides the best possible data for stock assessment purposes; d) investigating skipjack growth by validation studies of otolith readings and/or estimation of growth within MFCL from tag recapture data;	SC16-SA-IP-09 (Assessing trends in skipjack tuna abundance from purse seine catch and effort data in the WCPO) SC16-SA-IP-10 (Preliminary analysis and simulation of tag mixing and it's implication on the assessment of WCPO skipjack tuna) SC16-RP-PTTP-01 (Project 42: Pacific Tuna Tagging Project Report and Work Plan for 2020-2023)

	e) attempting to provide finalized catch estimates to SPC no later than June 1st.	SC16-RP-PTTP-02 (Project 42: Report of the Pacific Tuna Tagging Project Programme Steering Committee (17July2020))
SP Albacore	240. SC15 noted that the assumed future recruitment can have a large impact on the projection result. It was recommended that research be undertaken to quantify autocorrelation behaviour of recruitment to be included in the future projection.	Plans for the development of this functionality within MULTIFAN-CL are specified within SC16-SA-IP-01 (Development in the MULTIFAN-CL software 2019-20)
Sharks	289. SC15 noted that while the assessment estimates that overfishing is still occurring (F_{recent}/F_{MSY} was 3.94) the stock assessment also estimates a slight recovery in stock biomass in recent years (2013-2016). It remains unclear whether the stock status will continue to improve or perhaps decline in the future. To help clarify this issue SC15 recommends that stock projections based on the assessment are undertaken and presented to SC16.	US-funded Project 102 **(**Population projections for oceanic whitetip shark) is deferred.
	295. SC15 noted that following the implementation of CMM 2011-04 and CMM 2014-05, the amount of scientific information available per year on oceanic whitetip sharks and other sharks species covered by a retention ban and the ban on shark lines or wire traces (e.g., bycatch estimates, length measurement, species and sex identification, and biological samples) has declined. SC15 also noted that the decline in information available for the oceanic whitetip shark assessment resulted in higher uncertainty in stock status, especially in more recent years since the introduction of these CMMs. This will also affect the capacity of SC to undertake future assessments if this decline in available information persists. SC15 recommends that WCPFC16 gives more consideration to the data needs for estimating reliable CPUE and other inputs into assessments when management measures are put in place, as these measures may have unintended consequences on continued availability and reliability of data. SC15 also recommended that WCPFC16 also take these considerations into account when reviewing the relevant sharks CMMs.	WCPFC16 adopted a comprehensive shark measure CMM 2019-05 where data collection issues are fully reflected.
	296. Noting that no limit reference points have been adopted for oceanic whitetip sharks, as well as other WCPO shark species, SC15 recommends that WCPFC16 consider identifying appropriate limit reference points for WCPO sharks.	SC16-MI-IP-21 (Appropriate reference points for WCPO elasmobranchs (Project 103))
Southwest Pacific striped marlin	339. SC15 noted that there are no agreed limit reference points for the WCPO billfish. However, SC15 also noted that based on the adopted uncertainty grid, the southwest Pacific striped marlin assessment results indicate that the stock is likely overfished, and close to undergoing overfishing according to MSY-based reference points. SC15 recommends that WCPFC16 identify an appropriate limit reference point for this stock. Key management quantities can be found in Table SMLS-02. The recent spawning biomass depletion relative to the unfished condition was close to the LRP adopted for tunas ($SB_{recent}/SB_{F=0} = 0.2$). 341. SC15 recommended SC16 use stochastic stock projections, including the expansion of the geographic scope of CMM 2006-04 by assuming average fishing effort during 2000-2004 by CCMs and zero fishing mortality in assessment region	(WCPFC16, Para 459) The Commission noted with concern the current status of South Pacific striped marlin and agreed to revisit the limit reference point in 2020 at WCPFC17. SC16-MI-IP-12 (Terms of Reference for a project to identify appropriate Limit Reference Points for Southwest Pacific Ocean striped marlin and consideration of other billfish species) SC16-SA-IP-13 (Southwest Pacific striped marlin

	1, to evaluate the potential long-term performance of the CMM. 342. SC15 recommended that WCPFC16 consider measures to reduce the overall catch of this stock, including through the expansion of the geographical scope of CMM2006-04, in order to cover the distribution range of the stock.	stock projections to evaluate CMM 2004-06)
	343. The following research activities were recommended by SC15 in order to progress the assessment of Southwestern Pacific striped marlin. a) Improved estimates of life history parameters including growth, maturity, and natural mortality. Verify the aging method used to derive the growth relationship in order to inform meta analyses for M and steepness specific to SWPO striped marlin. Additionally, efforts should be made to increase sampling of smaller individuals. b) Better estimates of striped marlin movement (>180 days) are needed to characterize mixing rates across model region in order to develop spatially explicit model structure and improve upon "areas as fleets" approach. c) Improved estimates of conversion factors (such as weight-to-length and length-to-length) are needed, together with improved length-at-age estimates to better inform the data inputs used in the stock assessment. d) Conduct sensitivities analyses with respect to the uncertainties in conversion factors used in the stock assessment and assess whether this should be included as an axis in the structural uncertainty grid. e) Develop better estimates of historical catch (1950-1960) to resolve the potential issue of misidentification caused by merging the billfishes datasets.	This recommendation will be considered prior to the scheduled 2023 stock assessment for SP striped marlin.
North Pacific striped marlin	353. SC15 also highlighted the sharp decline in the stock biomass in the mid-1990s and recommends that ISC further investigate the reasons for this decline.	To be advised by the ISC at SC16.
	355. SC15 noted that while fishing mortality has declined since 2000 fishing mortality has generally remained above F_{MSY} since the introduction of CMM 2010-01 and the stock biomass continues to remain well below SB_{MSY} and the NC target, while noting that the assessment model overestimate biomass in the terminal years. This is despite the phased reduction of the total catch to 80% of the levels caught in 2000-2003 as prescribed in the CMM. SC15 recommends that WCPFC16 note that further reduction in catch will be required to rebuild the stock to MSY levels and the NC target. 357. SC15 recommends that WCPFC16 consider identifying appropriate limit reference points for WCNPO striped marlin. 358. SC15 recommends the WCPFC consider appropriate actions to ensure rebuilding this stock to the NC14 rebuilding target. SC15 noted that if lower than average recruitments persist over the near future the probability of rebuilding the stock would be low, noting that there has been a long-term decline in recruitment since the 1990s. Under the F_{MSY} scenario with short-term recruitment assumptions, the probability of achieving $20\%SB_0$ in 2027 is <0.5%.	WCPFC16 adopted an *Interim Rebuilding Plan for North Pacific Striped Marlin* (Attachment L, WCPFC16 Report), where the rebuilding target is 20%SSBF=0 to be reached by 2034, with at least 60% probability. This target is used as a limit reference point for WCPO tropical tunas. In addition, the Commission considered and specified that an appropriate action be developed in the future through the *Rebuilding Strategy* section in the Plan.
Target reference	372. SC15 recommends that the Scientific Services Provider update the analysis	WCPFC16-2019-15 (Minimum Target Reference

points for Yellowfin and bigeye tuna	to incorporate the updated assessment for skipjack, and that WCPFC16 take note of these results when identifying appropriate TRPs for yellowfin tuna and bigeye tuna in 2019 as scheduled in the Harvest Strategy Work Plan. In so doing WCPFC16 should clarify the management objectives for these species.	Points for WCPO yellowfin and bigeye tuna consistent with alternative LRP risk levels, and multispecies implications (update of SC15-SC16-MI-WP-01)) SC16-MI-WP-01 (Further consideration of candidate target reference points for bigeye and yellowfin tuna in the WCPO)
Target reference points for South Pacific albacore tuna	388. SC15 also noted that constant catch scenarios may mask declines in catch rates and associated economic conditions and requested that the Scientific Services Provider undertake a similar set of analyses based on fishing effort-based projections. SC15 recommends that WCPFC16 take note of both sets of results in consideration of rebuilding the South Pacific albacore stock to the interim TRP within 20 years.	WCPFC16-2019-19 (Alternative Trajectories to achieve the South Pacific albacore interim TRP (Update of SC15-SC16-MI-WP-02)) SC16-MI-IP-01 (Additional trajectories to achieve the South Pacific albacore interim TRP)
Target reference points for Skipjack tuna	395. Table 4 in SC15-MI-IP-09 (*Current and projected stock status of skipjack to inform of target reference points, MOW3-WP-03*) be updated based on the updated skipjack tuna assessment agreed by SC15. This table should indicate changes in effort and biomass from 2012 and the recent levels and median equilibrium yield (as a proportion of MSY) associated with strategies that maintain a median of spawning biomass depletion (SB/SBF=0) of 40%, 45%, 50%, and 55%.	WCPFC16-2019-14 (Current and projected stock status of WCPO skipjack tuna to inform consideration of an updated target reference point (update of SC15-SC16-MI-IP-09/MOW3-WP-03)) SC16-MI-WP-02 (Updates to WCPO skipjack tuna projected stock status to inform consideration of an updated target reference point)
	396. The projection results for skipjack tuna reported in SC15-MI-WP-11 also be updated based on the updated skipjack tuna assessment agreed by SC15.	WCPFC16-2019-17 (Evaluation of CMM 2018-01 (update of SC15-SC16-MI-WP-11)) SC16-MI-IP-23 (Evaluation of CMM 2018-01 for tropical tuna)
	398. SC15 also notes that WCPFC16 may identify a reference year, or set of years, which may be appropriate to use as a baseline for a skipjack TRP	WCPFC16 requested the SC to provide advice on the formulation of TRPs for skipjack tuna (Para 258, WCPFC16 Report) SC16-MI-WP-02 (Updates to WCPO skipjack tuna projected stock status to inform consideration of an updated target reference point)
Review of harvest control rules for skipjack tuna	422. SC15 also noted that as part of the monitoring strategy it will be necessary to define 'exceptional circumstances' to identify those situations that fall outside of the range of scenarios against which the implemented MP has been tested. SC15 again welcomed the progress on these issues and in reviewing the Reference set of uncertainties used in the MSE noted that these expand on the set of uncertainties included in the structural grid used in the stock assessment. SC15 recommended that an expanded set of diagnostics be provided so that the plausibility of the fit of each operating model used in the Reference set could be investigated. SC15 also recommended that the Scientific Services Provider	WCPFC16-2019-16 (Results of Initial Evaluations of Management Procedures for Skipjack (update of SC15-SC16-MI-WP-05)) SC16-MI-WP-03 (Overview of recent developments and key decisions for harvest strategies for WCPFC stocks and fisheries) SC16-MI-IP-03 (Results of re-evaluations of

	conduct appropriate inter-sessional consultation with CCMs on the conditioning of the operating model and other relevant issues to ensure greater inclusiveness for MSE process.	management procedures for skipjack tuna in the WCPO) SC16-MI-IP-07 (Developing a set of diagnostics and outputs for MULTIFAN-CL stock assessments) SC16-MI-IP-08 (Updating the WCPO skipjack operating models for the 2019 stock assessment)
	423. Third, noting that stakeholder engagement is a key component of the harvest strategy approach, SC15 reviewed information on a tool (Performance Indicators and Management Procedures Explorer, PIMPLE) for exploring and comparing the relative performance of alternative candidate MPs and the included HCRs (SC15-MI-WP-09). SC15 noted that PIMPLE was a useful tool and recommends it to mangers and WCPC16 so that they can understand the performance of various MPs for achieving management objectives. CCMs and participants were also encouraged to develop their own HCRs and make them available to the Scientific Services Provider for possible evaluation and inclusion in PIMPLE.	WCPFC16-2019-11 (Using the PIMPLE software to explore skipjack performance indicators) SC16-MI-IP-03 (Results of re-evaluations of management procedures for skipjack tuna in the WCPO)
	424. SC15 recommends that WCPFC16 note the progress on the development of the MSE being undertaken under the Harvest Strategy Work Plan for skipjack tuna and provide additional elements, if any, as specified in the Harvest Strategy Work Plan to further progress this work against the scheduled time-lines noted in this Work-Plan. SC15 also requested the Secretariat create a webpage under the current "Harvest Strategy" tab that compiles the latest information of MSE development so that stakeholders can find the relevant information easily.	The WCPFC16 adopted a revised harvest strategy work plan (Attachment H, WCPFC16 Report) Harvest Strategy website: https://www.wcpfc.int/harvest-strategy
Review of harvest control rules for South Pacific albacore	442. First, noting that the initial work on the development of harvest strategies for South Pacific albacore has focused on developing an empirical MP that uses standardised CPUE as the primary indicator of stock status, SC15 reviewed information on alternative sources of CPUE data and standardisation approaches to inform this process (SC15-MI-WP-07). SC15 endorsed the use of both the traditional GLM and the geostatistical modelling approaches for standardizing CPUE and their use in the Reference Set of uncertainties. Furthermore, noting difficulties associated with the use of the daily set-by-set data (currently used in the assessment) within the MSE framework, SC15 also endorsed the use of the aggregated catch/effort data set. However, SC15 also noted some small differences in the resulting biomass indicators based on these two different data sets, and requested that the Scientific Services Provider undertake some additional analyses to clarify any consequences on the performance of candidate HCRs which may be used to achieve management objectives.	Original paper: SC15-MI-WP-07 (CPUE analysis for South Pacific albacore) The following papers indirectly addresses this recommendation: SC16-MI-IP-04 (Retrospective CPUE forecasting of South Pacific albacore) SC16-MI-IP-05 (HCR design considerations for South Pacific albacore) SC16-MI-IP-11 (Report on the second external MSE review: Developments in the South Pacific albacore MSE framework)
	443. Second, SC15 reviewed a demonstration set of southern longline fishery performance indicators (PIs, taken from the list of prioritized indicators identified at WCPFC14) for evaluating the relative performance of candidate MPs South Pacific albacore, noting that the lack of inclusion of a PI, at this stage, does not	(Para 181, WCPFC16 Report) The Commission considered that it was important to consider economic indicators as performance indicators (PIs) and encouraged CCMs to assist the

	imply it has reduced priority in the framework (SC15-MI-WP-03). SC15 noted that the utility of many economic indicators is currently limited by the unavailability of specific fleet-based economic data with the consequence that less informative proxies have to be used. CCMs also noted that several of the PIs are similar and perhaps redundant. Several CCMs also noted that a number of important PIs are currently not included in the demonstration set (often due to a difficulty in calculation due to a lack of information) but expressed a willingness to work with the Scientific Services Provider and other CCMs on providing more information for improving the calculation of these proposed PIs. SC15 recommends that WCPFC16 take note of this demonstration set of PIs and provide feedback to the Scientific Services Provider as needed.	Scientific Services Provider by providing economic and other data to assist in development of PIs, including in relation to the disproportionate burden on SIDS, particularly with respect to multi-species fisheries.
	444. Third, SC15 reviewed the current status of the MSE framework for South Pacific albacore and the details of some illustrative analyses that have been completed (SC15-MI-WP-08). SC15 made a number of suggestions aimed at clarifying and improving aspects of the analyses, such as being able to see retrospective analysis of the CPUE generated from the operating model, incorporating the DWFN index in the HCR, and including a density dependence/hyperstability option and recruitment autocorrelation in the Reference Set of the uncertainty grid. One CCM also suggested inclusion of an additional flux of South Pacific albacore from the IATTC convention area as an additional axis of uncertainty, but it was noted that this would be difficult. CCMs were also invited to suggest possible HCRs for testing in this MSE framework for South Pacific albacore. SC15 recommends that WCPFC16 note the current status of the MSE framework for South Pacific albacore and provide feedback to the Scientific Services Provider as needed.	(Para 195. WCPFC16 Report) The Commission agreed to task the Scientific Committee and the Scientific Services Provider with progressing work on a multispecies approach and to report back to the Commission. SC16-MI-IP-04 (Retrospective CPUE forecasting of south Pacific albacore) SC16-MI-IP-05 (HCR design considerations for south Pacific albacore)
Multi-species modeling framework	457. SC15 recommends that WCPFC16 note the approaches outlined in the above paper, and the possible implications of the challenges in developing a multi-species modelling framework on this item within the schedule of the Harvest Strategy Work Plan.	SC16-MI-IP-06 (Further consideration of the mixed fishery management strategy evaluation framework for WCPO tuna stocks)
Science–management dialogue	469. Noting the decision made by WCPFC15 to hold a 6-day annual meeting in 2019 with additional time devoted for the Commission to discuss harvest strategies, SC15 re-iterated its support for a Science-Management Dialogue as outlined in the recommendation from SC14 (Paras. 469-473, SC14 Summary Report) for prompt development of harvest strategies. Noting the work on Harvest Strategies at SC15 and the increasing number of issues that require the attention of managers, some CCMs expressed the view that a Science-Management Dialogue session after SC15 meeting would have been useful, and supported such an approach after SC16.	Para 207, WCPFC16 Report: The Commission noted that the Scientific Services Provider is planning to continue to undertake workshops for individual CCMs to build capacity on harvest strategies. SC16-MI-WP-03 (Overview of recent developments and key decisions for harvest strategies for WCPFC stocks and fisheries)
Limit reference points for WCPFC sharks	473. Noting the final report of the project "Identifying appropriate reference points for elasmobranchs within the WCPFC" (SC15-MI-IP-04), the outcomes of the stock assessments for oceanic whitetip sharks reviewed by this meeting, but an inability to fully consider this agenda item due to time constraints, SC15	SC16-MI-IP-21 (Appropriate reference points for WCPO elasmobranchs (Project 103))

	deferred consideration of appropriate limit reference points for elasmobranchs for the WCPFC to SC16. SC15 recommends that the key conclusions of SC15-MI-IP-04 and previous reports are summarized and presented to SC16 together with any other relevant information. Nevertheless, SC15 recommends that WCPFC16 note the conclusions of the above report and the ongoing need to identify appropriate limit reference points for WCPO elasmobranchs.	
Implementation of CMM 2018-01	487. The minor adjustments to the CMM 2017-01 text contained in CMM 2018-01, including the inclusion of paragraph 18, were found to not materially affect the management conditions assumed under this evaluation. SC15 noted, however, the difficulty in evaluating the impacts of paragraph 18 because of the need for clearer guidance on the interpretation of "small garbage". SC15 recommends that the Commission revise paragraph 18 to include a more quantifiable and precise definition, so that a more meaningful evaluation of impacts may be undertaken. 455.	No revision was made at WCPFC16 and subsequently the paragraph 18 has expired. SC16-MI-IP-23 (Evaluation of CMM 2018-01 for tropical tuna)
	492. SC15 recommended that the working paper be updated based on the WCPO skipjack tuna assessment agreed by SC15, including the additional analyses requested by CCMs, and forwarded to WCPFC16.	WCPFC16-2019-17 (Evaluation of CMM 2018-01 (update of SC15-MI-WP11) SC16-MI-IP-23 (Evaluation of CMM 2018-01 for tropical tuna)
FAD tracking	509. SC15 recommends that this paper (SC15-MI-WP-12 *Report on analyses of the 2016/2019 PNA FAD tracking programme*) be forwarded to WCPFC16 who may wish to support the continuation of this work.	WCPFC16-2019-IP06 (Report of the analyses of the 2016_2019 PNA FAD Tracking Programme (SC15-2019-MI-WP12)) SC16-MI-IP-13 (Estimates of the number of FAD deployments and active FADs per vessel in the WCPO) SC16-MI-IP-14 (Report on analyses of the 2016/2020 PNA FAD tracking programme)
Acoustic FADs	522. SC15 indicated strong support for these projects, identifying the need for improved information on skipjack abundance and that this work can also serve several other research purposes. SC15 recommends that WCPFC16 support the continuation of this work.	SC16-MI-IP-20 (Updates on Project 88: FAD acoustics analyses)
Review of shark measures	540. Related to CMM2010-07 (CMM for Sharks), SC15 recommends that TCC15 and WCPFC16 note that since the adoption of the CMM 2010-07, SC has been unable to confirm the validity of using a 5% fin-to-carcass ratio, that an evaluation of the 5% ratio is not currently possible due to insufficient or inconclusive information, and that there is still no mechanism for generating the data necessary to review the fin-to-carcass ratio if such a ratio is to be used as a tool for promoting the full utilization of sharks in the WCPFC.	This recommendation is addressed by adopting CMM 2019-04 (CMM for Sharks), which will become effective on 1 November 2020.

Safe release guidelines of sharks	561. SC15 recommends to WCPFC that: • When the safe release guidelines are next updated they should properly reflect the findings in SC15-EB-WP-01 and SC15-EB-WP-04 and subsequent research on post release mortality mitigation, noting some CCMs expressed concerns that research mentioned in SC15-EB-WP-04 only applies to six fleets (New Zealand, Fiji, Marshall Islands, New Caledonia, American Samoa, and Hawaii) and that there might be other choices of better safe release methods. • The Monte Carlo analysis undertaken in 2015 (SC11-EB-WP-02) for oceanic whitetip and silky sharks be updated and amended as necessary using the latest results on post-release mortality under different handling and release practices. This analysis should explore and quantify the impact of different combinations of gear, mitigation and handling practices on fishing related mortality. The example R code to conduct this analysis is provided as an appendix to SC15-EB-WP-01.	Project 101 (Updated Monte Carlo simulations of the potential of longline shark mitigation approaches incorporating updated knowledge) was deferred.
Shark research plan	569. SC15 accepted the outputs of ISG-08 and the Shark Research Plan, which is in Attachment F.	SC16-EB-IP-01 (2021-2025 Shark Research Plan)
Seabird research	592. SC15 recommends that: • TCC and WCPFC pay particular attention to assessing compliance against the requirements of the seabird mitigation measure CMM 2018-03. • WCPFC adopt the ACAP best practice on hook removal from seabirds as a safe handling guideline across all WCPFC longline, and other hook fisheries (SC15-EB-WP-10). • WCPFC notes that, in view of analyzing the effectiveness of night setting within the seabird bycatch mitigation measure, the Coordinated Universal Time (UTC) set time will need to be provided or obtainable from the WCPFC ROP longline data field. • WCPFC consider supporting the analysis of overlap between fishing effort distribution and species-specific seabird distribution (as outlined in SC15-EB-WP-03) to both the WCPO Southern and Northern Hemispheres and to support an assessment of risk to populations resulting from fisheries- induced mortalities. WCPFC requests CCMs to meet their obligations with respect to the minimum levels of observer coverage required by CMM 2018-05.	WCPFC16 Report: 505. The Commission adopted the Safe handling and release guidelines for seabirds as a Supplement to CMM 2018-04 (Attachment N). 506. WCPFC16 noted that, in view of analysing the effectiveness of night setting within the seabird bycatch mitigation measure, the Coordinated Universal Time (UTC) set time will need to be provided or obtainable from the WCPFC ROP longline data field. 507. WCPFC16 supported the analysis of overlap between fishing effort distribution and species-specific seabird distribution (as outlined in SC15-EB-WP-03) to both the WCPO Southern and Northern Hemispheres and to support an assessment of risk to populations resulting from fisheries- induced mortalities. SC16-ST-IP-02 (Status of observer data management)
Pacific Tuna Tagging Project	614. SC15 noted the successful 2018 CP13 tagging cruise, in which 1,133 tropical tunas, mainly bigeye and yellowfin tuna, were tagged with conventional and/or archival tags. 615. SC15 noted the importance of effective tag seeding to estimating reporting rates, supported increased deployment and fleet coverage of tag seeding	WCPFC16 approved the PTTP budget of $645,000. SC16-RP-PTTP-01 (Report of the Pacific Tuna Tagging Programme Steering Committee)

	experiments and noted the need for continued CCM participation and support in tag reporting. 616. SC15 supported additional tagging of tropical tuna marked with strontium chloride, to assist in validating otolith-based ageing methods, and requested the support of CCMs in enabling the collection of samples from such recaptured tagged fish. 617. SC15 supported the 2020 tagging programme, and associated budget ($645,000), the 2021-2022 tagging programmes and their associated indicative budgets ($730,000; $730,000), and the PTTP work plan in general for 2019-2022	SC16-RP-PTTP-02 (Project 42: Pacific Tuna Tagging Project Report for 2019-2022)
WCPFC Tuna Tissue Bank	621. SC15 noted the reduction in sampling in 2018 and requested that SPC develop initiatives to reverse this trend if possible, and report these to SC16. 622. SC15 encouraged CCMs to visit the TTB web page https://www.spc.int/ofp/PacificSpecimenBank and provide feedback to SPC on its information content, usability and structure. 623. SC15 endorsed the TTB work plan for 2019-2020, as well as the proposed 2020 budget ($99,195) and 2021-22 indicative budgets ($101,180; $103,204).	WCPFC16 approved the TTB budget of $99,195. SC16-RP-P35b-01 (Project 35b: WCPFC Tuna Tissue Bank) SC16-RP-P35b-02 (Appraisal of new biological sampling approaches for tropical tunas on purse seiners) SC16-RP-P35b-03 (Report of the Tuna Tissue Bank Steering Committee)

ISSUES/INFORMATION ARISING FROM WCPFC16
(Report paragraphs indicated below)

Issues	References	Outputs/Comments
Performance Indicators and Monitoring Strategy	181. The Commission considered that it was important to consider economic indicators as performance indicators (PIs) and encouraged CCMs to assist the Scientific Services Provider by providing economic and other data to assist in development of PIs, including in relation to the disproportionate burden on SIDS, particularly with respect to multi-species fisheries.	SC16-MI-WP-03 (Overview of recent developments and key decisions for harvest strategies for WCPFC stocks and fisheries): • This paper noted that there was no progress in the inclusion of economic indicators. SC16-MI-IP-02 (Developing the monitoring strategy for the WCPFC harvest strategy for WCPO skipjack) • B.3 Performance indicator 5: Maximise SIDS revenues from resource rents
Management strategy evaluation	195. The Commission agreed to task the Scientific Committee and the Scientific Services Provider with progressing work on a multispecies approach and to report back to the Commission.	SC16-MI-IP-06 (Further consideration of the mixed fishery management strategy evaluation framework for WCPO tuna stocks)
TOR for management dialogue	207. The Commission noted that the Scientific Services Provider is planning to continue to undertake workshops for individual CCMs to build capacity on harvest strategies.	SC16-MI-WP-03 (Overview of recent developments and key decisions for harvest strategies for WCPFC stocks and fisheries) WCPFC16-2019-IP-14 (National Harvest Strategy Capacity Building Workshops for WCPO tuna

		fisheries)
HS work plan	221. The Commission adopted the Updated Indicative Workplan for the Adoption of Harvest Strategies under CMM 2014-06.	Attachment H, WCPFC16 Report
TRP for skipjack	258. The Commission requested the Scientific Committee to provide advice on: a. the formulation of TRPs for skipjack tuna, noting: i. the SC15 advice on a skipjack tuna TRP *"that the Commission may identify a reference year, or set of years, which may be appropriate to use as a baseline for a skipjack TRP*."; and ii. the approach to the formulation of a skipjack tuna TRP proposed in **WCPFC162019-DP01;** and b. effort creep estimated in relation to the TRPs. 259. The Commission also requested the Scientific Service Provider to revise **WCPFC16-2019-15** using candidate revised interim skipjack TRPs of 42%,44%, 46%, 48% and 50% of SB/SBF=0.	SC16-MI-WP-02 (Updates to WCPO skipjack tuna projected stock status to inform consideration of an updated target reference point) SC16-MI-IP-15 (Examining Indicators of Technological and Effort Creep in the WCPO Purse Seine Fishery)
TRP for bigeye and yellowfin	273. The Commission requested the Scientific Committee to provide advice on the formulation of TRPs for bigeye and yellowfin tuna for other candidate TRP indicators other than depletion ratio, such as longline CPUE. 274. The Commission further requested the Scientific Service Provider to conduct an analysis for bigeye and yellowfin tuna similar to that undertaken in WCPFC16-2019-14 for skipjack. It further tasked SC16 in 2020 to review the bigeye and yellowfin assessments, advise on the uncertainty grid and provide advice on the range of depletion for analysis. With regard to the range of depletion, the Commission tasked the Scientific Service Provider to conduct the analysis and present their outcomes in 2020 to the TCC16 and WCPFC17. 275. The Commission considered the development of target reference points for bigeye and yellowfin and agreed that in the interim paragraphs 12 and 14 of CMM 2018-01 be retained. It further tasked the Scientific Committee and the Scientific Service Provider to continue to explore potential candidate target reference points for the two stocks.	SC16-MI-WP-01 (Further consideration of candidate target reference points for bigeye and yellowfin tuna in the WCPO) SC16-SA-WP-03 (Stock assessment of bigeye tuna in the western and central Pacific Ocean) SC16-SA-WP-04 (Stock assessment of yellowfin tuna in the western and central Pacific Ocean)
FAD management	366. The Commission agreed the FAD Management Options Intersessional Working Group would meet in 2020 and that the Working Group would consider the report and recommendations of the second Joint t-RFMO FAD Management Working Group and report back to the Commission on the merits and relevance for tropical tunas of those recommendations.	The 4th FAD MO-IWG electronic meeting
Other commercial fisheries	376. The Commission tasked the Scientific Services Provider, in collaboration with Indonesia and the Philippines, to develop a paper containing all information on 'other fisheries' to be presented to the Scientific Committee and Technical Compliance Committee in 2020, to review and advise the Commission with the aim of reviewing paragraph 51 in CMM 2018-01 to ensure appropriate limits can be determined, measured and assessed in the Compliance Monitoring Scheme.	SC16-MI-IP-17 (Availability of catch estimates from the other commercial fisheries in the Philippines) SC16-MI-IP-18 (Availability of catch estimates from the other commercial fisheries in Indonesia)
SP albacore roadmap	390. The Commission agreed to reinvigorate the South Pacific Albacore Roadmap Working Group in 2020 under the leadership of Fiji and for it to continue to work	The SP albacore Roadmap IWG – electronic meeting

	intersessionally to develop the Roadmap for Effective Conservation and Management of South Pacific Albacore. 391. The Commission further agreed that the South Pacific Albacore Roadmap Working Group would meet in the margins of SC16 and TCC16 and that during the intersessional period it would work to develop its workplan and terms of reference.	
HCRs and MSE	403. The Commission noted the progress on the development of harvest control rules and management strategy evaluation for South Pacific albacore.	SC16-MI-WP-03 (Overview of recent developments and key decisions for harvest strategies for WCPFC stocks and fisheries) SC16-MI-IP-01 (Additional trajectories to achieve the South Pacific albacore interim TRP) SC16-MI-IP-04 (Retrospective CPUE forecasting of south Pacific albacore) SC16-MI-IP-05 (HCR design considerations for south Pacific albacore) SC16-MI-IP-11 (Report of the second external MSE technical review: Developments in the SP-ALB MSE framework)
HS for NP swordfish	434. The Commission accepted the recommendation from the Northern Committee on a harvest strategy for North Pacific Swordfish.	WCPFC16, Attachment K
HS for NP striped marlin	452. The Commission adopted the Interim Rebuilding Plan for North Pacific Striped Marlin.	WCPFC16, Attachment L
LRP for SP striped marlin	459. The Commission noted with concern the current status of South Pacific striped marlin and agreed to revisit the limit reference point in 2020 at WCPFC17.	SC16-MI-IP-12 (Terms of Reference for a project to identify an LRP for Southwest Pacific Ocean striped marlin and consideration of other billfish)
SWP swordfish	482. The Commission tasked the Scientific Committee in 2020 (SC16) to consider a review (self-funded and developed by Australia, in consultation with interested CCMs) of possible measures and options relevant to the management of swordfish taken as bycatch in longline fisheries. The review may include information from available research and literature, logbook and observer data (in appropriately aggregated forms). 483. The Commission requested the WCPFC Chair to write to the IATTC Chair to: a. Express the Commission's significant concern over the lack of scientific assessment and specific management measures for South Pacific Swordfish in the IATTC area; b. Seek that the IATTC prioritise the development of a management measure that ensures catch levels are maintained within sustainable levels, and	SC16-MI-IP-22 (A review of potential options for managing swordfish taken as bycatch in longline fisheries) WCPFC Circular 2020/31 (Exchange of letters between WCPFC and IATTC on Southwest Pacific Swordfish) • While WCPFC has CMM 2009-03 (swordfish), IATTC currently does not have any measure on swordfish. However, the most recent assessment of the stock of swordfish in the South EPO was conducted with Stock Synthesis, using data updated to April 2011, and a benchmark

	Urge cooperation between IATTC and WCPFC on this issue.	assessment of the South Eastern Pacific Ocean swordfish stocks will be carried out in 2020-2021.
LRP for sharks	484. The Commission noted that the Scientific Committee is working on appropriate LRPs under Project 103 and encouraged the Scientific Committee to develop appropriate LRPs given their importance in harvest strategies.	SC16-MI-IP-21 (Appropriate reference points for WCPO elasmobranchs (Project 103))
CMM for sharks	493. The Commission adopted Conservation and Management Measure for Sharks. The Commission further agreed that this measure would become effective on 01 November 2020 and that it shall replace CMM 2010-07 Conservation and Management Measure for Sharks, CMM 2011-04 Conservation and Management Measure for Oceanic Whitetip Sharks, CMM 2012-04 Conservation and Management Measure for the protection of whale sharks from purse seine operations, CMM 2013-08 Conservation and Management Measure for Silky Sharks, and CMM 2014-05 Conservation and Management Measure for Sharks at that time.	WCPFC16, Attachment M – CMM 2019-04
CMM for mobulid rays	515. The Commission tasked the Scientific Services Provider with reviewing the data available via the Regional Observer Program and *Scientific data to be provided to the Commission* and identify any additional data requirements to undertake an assessment, either via traditional stock assessments or on the basis of quantitative risk assessments, ecological risk assessments, indicators assessment or other data-poor analytical techniques. Such information shall be considered by the Scientific Committee to advise the Commission on the feasibility and schedule for an assessment for mobulid rays. 516. If the Scientific Committee advises that an assessment is feasible, and resources are made available, the Commission tasks the Scientific Services Provider to present, by 2023, an assessment of the status of mobulids to the Scientific Committee. 517. The Commission adopted the Conservation and Management Measure on Mobulid Rays caught in association with fisheries in the WCPFC Convention Area (**Conservation and Management Measure 2019-05, Attachment O***). The Commission requests the Scientific Committee to recommend, whenever considered adequate based on evolving knowledge and scientific advice, further improvements to the handling practices detailed in Annex 1 of **CMM 2019-05**.	SC16-SA-IP-12 (Data review and potential assessment approaches for Mobulids in the Western and Central Pacific Ocean)
Protection of cetacean	520. The Commission tasked the Scientific Committee in 2020 (SC16) to develop and recommend best handling practices for the release of cetaceans, taking into account existing standards or guidelines adopted in other fora, for consideration at WCPFC17. 521. The Commission tasked the Scientific Services Provider to review available data to provide estimates of fishery interaction types and levels with cetaceans, without respect to particular flags, to the lowest possible taxonomic level, in the WCPF Convention Area, and to provide a report to the Scientific Committee for its review.	Development of best handling practices for the release of cetaceans – deferred to SC17 SC16-ST-IP-12 (Available data on Cetacean interactions in the WCPO tropical purse seine fishery)