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Overview of recent developments and key decisions for harvest strategies for WCPFC stocks and fisheries

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Rev 1 includes additional point for SC16 consideration in the executive summary:

- **advice on the adequacy of the uncertainties (and their ranges) included in the skipjack and SP albacore MSE framework (MI-IP03; MI-IP05, MP-IP08).**

Executive Summary

The last year has seen significant progress in the technical aspects of the harvest strategy workplan. To facilitate discussions at the electronic SC16, this paper provides summaries of 10 harvest strategy related papers submitted to SC16 along with updates on progress with stakeholder engagement and capacity building activities and revisits the key decisions and advice topics that were raised in 2018 at SC14 (WCPFC-SC14-2018/MI-WP05).

The skipjack and South Pacific albacore MSE work is now progressing to the stage of evaluation studies. Elements of the South Pacific albacore MSE framework have also now received external expert review. While refinements to the modelling framework will continue to occur, greater input from managers and stakeholders will be important over the coming year to contribute to the design of more formal evaluation studies to inform the choice of management procedures for these two key tuna stocks in the WCPO, and support the WCPFC to meet its targets under the current WCPFC harvest strategy workplan.

To facilitate progress from technical MSE development and testing of management procedures, to adoption and eventual implementation of harvest strategies, will involve consideration of trade-offs among management objectives. Science advice around these trade-offs will be important. To support continued progress of the harvest strategy workplan, mechanisms to allow scientific outputs to be reviewed by managers, and for managers to guide further work will be needed. We encourage the SC16 to consider providing advice on approaches to achieve this (e.g. the concept of a 'Science Management Dialogue' proposed at SC15; SC15-MI-IP-08).

Following recent developments in the MSE framework for skipjack and albacore, the technical team will look to develop the multispecies modelling framework, as endorsed at SC15. This presents various achievable challenges from a technical perspective.

COVID19 has impacted the momentum with stakeholder engagement and capacity building that was gained through 2019 and early 2020, when the project had offered training on harvest strategies to approximately 170 fishery agency staff from 11 member countries. We are now pursuing approaches to online/remote workshops to continue this important aspect of the harvest strategy workplan, including increased engagement with all CCMs.

We invite SC16 to provide**:**

- advice on candidate HCR designs for both skipjack and SP albacore (MI-IP03; MI-IP05);
- feedback on the presentation of MSE results to assist decision making (MI-IP03; MI-IP05);
- recommendations for any additional diagnostics that should be included in the online tool developed to display OM (and stock assessment) diagnostics (the 'hierophant'; MI-IP07);
- feedback on the specific requests regarding the calculation of performance indicators for the skipjack monitoring strategy (MI-IP02);
- advice on the adequacy of the uncertainties (and their ranges) included in the skipjack and SP albacore MSE framework (MI-IP03; MI-IP05, MP-IP08).

Further, to progress the development of harvest strategies for WCPO stocks and fisheries, the SC may wish to seek advice from the Commission on the following issues:

- Definition of fisheries and fishery controls within the harvest strategy (MI-IP03; MI-IP05);
- Procedures for selecting the 'best performing' MP (MI-IP03).

Background

In response to the WCPFC establishing CMM 2014-06 *"Conservation and management measure on establishing a harvest strategy for key fisheries and stocks in the western and central Pacific ocean"* Link, the scientific services provider "The Pacific Community" (SPC) with support from the New Zealand Ministry of Foreign Affairs and Trade (MFAT) developed and implemented the "Pacific Tuna Management Strategy Evaluation Project". This project was designed to provide the necessary scientific tools to support the WCPFC members to develop harvest strategies for the key tuna stocks in the WCPO: skipjack, South Pacific albacore, yellowfin and bigeye tuna. Specifically, the project aims to develop management strategy evaluation (MSE) models and decision support tools that can be used to compare the relative performance of alternative management procedures (see below) in meeting objectives of WCPFC members. The project also has a strong focus on capacity building so that regional stakeholders can make informed decisions on the various aspects of harvest strategy development. The project is closely aligned with the harvest strategy work plan of the WCPFC Link and various aspects of its progress depend on input from the Scientific Committee (SC) and the Commission. Over time, aspects of the project have been adapted to accommodate changes in the WCPFC harvest strategy workplan (HSWP) and requests from members through the SC and Commission meetings.

The Commission's goal, as reflected in the revised HSWP, is that by 2022 a harvest strategy will be adopted for skipjack tuna in the WCPO, and management procedures developed for South Pacific albacore. The scientific committee (SC) and the Commission will benefit from an update on progress of the underpinning technical work and review of the collective science-management decision making required to meet the 2022 target for skipjack, but also to make progress on yellowfin, bigeye, South Pacific albacore and the multispecies/mixed fishery approach.

The objectives of this paper are:

1. Summarise the recent progress of the MSE technical work (papers submitted to SC16),
2. Review progress on key science-management decisions required to guide the MSE project and harvest strategy development forward.

Terminology

Clear and consistent terminology is important for effective communication and discussion of this work. Before progressing further, it is important to be clear on the various terminologies that will be used in the paper.

Harvest strategy is an umbrella term that includes:

- The specification of the management objectives for the fisheries,
- How success in meeting the objectives is monitored and assessed, which typically includes specification of performance indicators and target and limit reference points,
- A '**management procedure'** that determines how management regulates fishing opportunities that will comprise:
    - The data collection process
    - An estimation process that provides an indication of stock status,
    - A harvest control rule (HCR)
- A monitoring strategy that monitors the actual performance of the adopted management procedure in relation to defined management objectives.

It is important to note that a harvest strategy sits below higher-level management and governance frameworks or policies that determine 'how' fishing opportunities are regulated (i.e. catch, gear, spatial/temporal closures, direct effort-based controls), and allocated. A harvest strategy cannot function independently of these higher-level management and governance frameworks being in place.

When a harvest strategy is operational it is the 'management procedure' that is used to determine future fishing opportunities and to provide the recommendation to managers on adjustments to fishing pressure.

In the MSE work being conducted by the SPC, simulation frameworks are being developed that can test and compare alternative 'management procedures' in order to enable the selection by the SC/WCPFC stakeholders and managers of the one most likely to deliver desired management objectives. It is important that the adopted management procedure is robust to uncertainty in, for example, alternative biological assumptions, future fishery dynamics and environmental conditions.

A key point here is that although the MSE work is focussed on testing 'management procedures', the candidate management procedures cannot be evaluated effectively without clarification of the other components of a harvest strategy, in particular the objectives. This requires negotiation and decisions by managers and stakeholders recognising there will be trade-offs among meeting different objectives. The WCPFC, stakeholders and managers will eventually need to develop a process to navigate through this trade-off landscape and guide selection of the 'best performing' management procedure.

Much of the work that will be described in this update paper has been dealing with the technical challenges of developing simulation frameworks, initially focussed on skipjack and South Pacific albacore tuna in line with the WCPFC workplan. Management procedures for these stocks can be more readily developed because most of the WCPO catches of these species are taken by a few defined fisheries. Yellowfin and bigeye tuna are taken across a range of fisheries, including those that predominantly harvest skipjack and South Pacific albacore. This complicates the development of management procedures for these species. This issue is discussed in the multispecies approach paper summarised below. Under the current WCPFC workplan it is expected that management procedures for skipjack and South Pacific albacore are developed and, for skipjack, implemented in 2022, making these two stocks of higher priority in terms of workflow. Please refer to the more detailed SC16 papers indicated within this overview.

1. Review of recent progress of the MSE technical work

Skipjack MSE framework and monitoring strategy

SC16-MP-IP-08: Updating the WCPO skipjack operating models for the 2019 stock assessment

In 2019 a new skipjack assessment was accepted by the SC and it was requested that the previously developed skipjack MSE framework, based on the 2016 skipjack assessment, be updated to take account of the changes in the 2019 assessment, and subsequent SC15 recommendations. An important component of this work was to update the operating models (OMs) of the skipjack MSE framework.

The OMs of the MSE framework are responsible for simulating the dynamics of the stock and fishery. The OMs generate the performance indicators through which alternative management procedures are compared. Multiple OMs are used to represent a range of uncertainties in our understanding of skipjack population biology and impacts of fishing (referred to as the 'OM grid'). The OM grid, therefore, produces a range of estimates for the performance indicators that are expected to capture their range of uncertainty. For MSE studies it is important that the type and scale of uncertainty included in the OM grid represents plausible future scenarios against which a management procedure should be tested. Important to note is that for an MSE study the OM uncertainty grid will typically include more scenarios than in the stock assessment conducted as part of the monitoring strategy, and may include more extreme but plausible uncertainties (referred to as a 'robustness set').

This paper updates the skipjack OM grid, based on the recent 2019 skipjack assessment. There were some minor differences between the updated OM grid and the 2019 assessment model grid (see relevant paper for details). Overall, despite significant changes from the 2016 to 2019 model structures, the OM grid showed very similar trends, variation and range of depletion levels as estimated for the OM based on the 2016 assessment model. The OM model fits to data diagnostics also showed broadly consistent model fits across the OM grid, and none of the models provided implausible outputs that would indicate failure to fit.

The outcomes suggest that the revised skipjack OM grid is suitable for evaluating management procedures. We note that, provided that future stock assessments fall within the range of uncertainty included in the OM grid, it should not be necessary to update the suite of OMs when a new stock assessment is conducted.

SC16-MP-IP-09: Developing management procedures for WCPO skipjack: 'The estimation model'

The role of the estimation model in the harvest strategy's management procedure is to provide an estimate of stock status to feed into the harvest control role (HCR). The role of the estimation model should not be confused with the stock assessment conducted as part of the monitoring strategy (discussed in paper below). They are two separate and independent activities. The point of MSE evaluation is to find a management procedure that best achieves management objectives in the face of uncertainty. Importantly, the estimation model in a management procedure need not necessarily be the same model as the stock assessment conducted as part of the monitoring strategy. It may, for example, be a simple empirical indicator such as catch per unit effort (CPUE), as in the case of South Pacific albacore (discussed below). The important point is the chosen management procedure is the most likely to achieve desired management outcomes and is agreed by stakeholders.

Note that once a harvest strategy is implemented the stock assessment is no longer the main driver of management advice in terms of regulating fishing opportunities, *this is the role of the management procedure*. The stock assessment becomes a key part of the monitoring strategy discussed below. The stock assessment should remain as the best scientific advice on the status of the stock and on how well the management procedure is performing in delivering the desired objectives. The stock assessment may change and improve over time, however the estimation model in the management procedure remains fixed unless there is evidence that it is no longer performing as expected.

For the skipjack MSE framework the estimation model is an MFCL (MULTIFAN-CL) integrated assessment model. However, it is a slightly simplified version of the full stock assessment model. It is important that the estimation model can reliably estimate stock status so that it passes appropriate advice to the harvest control rule. This paper compared the performance of an MFCL based estimation model with the model used in the recent 2019 stock assessment, and the revised OM grid discussed above.

The results indicate that the skipjack MSE estimation model performed well in comparison to the 2019 stock assessment model and the revised OM grid. The estimation model can therefore provide a reliable and consistent estimate of stock status and can be used as part of a management procedure for WCPO skipjack.

SC16-MP-IP-10: Simulating future data for WCPO skipjack harvest strategy evaluations

This paper describes the settings and procedures to simulate catch, effort, length frequency and tag recapture data from the WCPO skipjack OM grid of models to represent this range of plausible uncertainty scenarios. The validity of the simulated data is determined through comparisons between historical observed data to the simulated data.

The results indicate that simulated catch, effort, size composition and tag recapture data generated by the OMs within the evaluation framework are, for the most part, a close approximation to their real-life counterparts. Importantly, deficiencies identified in the simulated data did not unduly affect the ability of the estimation model to reliably estimate stock status. As such, while refinements will be made in future, the current approach appears suitable to progress with evaluations of management procedures for skipjack.

SC16-MI-IP-03: Re-evaluation of HCRs for WCPO skipjack

MSE results have previously been presented to WCPFC-SC15 using an evaluation framework based on the 2016 skipjack assessment. This paper presents results from similar evaluations based on an MSE framework updated in accordance with the 2019 skipjack assessment model, and considers the next steps to be taken as scheduled in the harvest strategy work plan updated by WCPFC16. The harvest control rules (HCR) evaluated in this paper are unchanged from the those evaluated previously. Comparisons of evaluation results between the previous and the updated MSE frameworks show the comparative performance of the HCRs tested is similar in each case.

The full skipjack MSE model framework has now been updated to be consistent with the 2019 skipjack assessment and testing of evaluations in this paper show that it is performing well and can be used to progress further the testing of management procedures for skipjack.

SC16-MI-IP-02: Developing the monitoring strategy for the WCPFC harvest strategy for skipjack

The monitoring strategy is a key component of a harvest strategy. Its purpose is to monitor the stock and fishery and check that the adopted management procedure is performing as expected in relation to agreed management objectives.

Monitoring of a management procedure will include:

- Calculation of performance indicators from observed data that evaluate actual performance of the adopted management procedure in relation to objectives;
- Periodic review of MSE simulations to ensure that the data and assumptions that underpin the selection of the management procedure remain appropriate;
- Stock assessment to monitor the biological performance indicators and also to feed into periodic review of the MSE grid;
- Definition of exceptional circumstances to identify situations that fall outside the assumptions over which the management procedure was tested.

To the extent possible, the indicators used to monitor the performance of the adopted management procedure should be the same as those used to compare and select the management procedure from the MSE simulations. However, the monitoring strategy may include additional performance indicators, depending on data availability, and new indicators may be developed as additional data sources are made available. As such a monitoring strategy may evolve over time.

Exceptional circumstances are events that fall outside the range of assumptions over which the adopted management procedure has been tested by MSE simulations. They may also include situations where the trajectory of the stock has not responded as expected to management action. Exceptional circumstances and related actions should be broadly defined in the monitoring strategy. They have not been discussed in detail in this paper and require further discussion and advice from SC and the Commission.

This paper describes progress towards developing a monitoring strategy to support the skipjack harvest strategy. The indicators discussed in the paper are underpinned by the set of management objectives put forward to the WCPFC by the SC for the tropical purse seine skipjack tuna fishery in 2017. It is proposed that the monitoring strategy for skipjack continues to be developed and provide a basis for developing similar strategies the other key tuna stocks**.**

Note on economic indicators
The paper highlights that some gaps remain. The Commission noted (WCPFC16) *the importance of economic indicators as performance indicators and encouraged CCMs to assist the Scientific Services Provider by providing economic and other data to assist in development of performance indicators, including in relation to the disproportionate burden on SIDS, particularly with respect to multi-species fisheries (Paragraph 181, WCPFC16 Summary Report).*

We note that neither FFA or SPC has been tasked by the WCPFC or associated bodies to collect economic data. FFA was assisting members to facilitate agreement to guidelines that could be used if CCMs wished to submit economic data to the Commission. However, FFA note the proposed guidelines developed based on agreed principles were not accepted by SC15, which "recommended that further intersessional work be undertaken to further develop such guidelines and any associated documents required with regard to the confidentiality and use of any economic data provided under this process".

There has been limited further progress on this, and as such explicit economic indicators cannot be included at this stage. It is also important to recognise that the current modelling framework cannot generate explicit economic performance indicators. However, we note that proxies such as CPUE and size frequencies could be utilised based on equating these to specified economic objectives pending further advice from stakeholders.

South Pacific albacore MSE framework

SC16-MI-IP-04: Retrospective CPUE forecasting for the South Pacific albacore

To support development of a roadmap for South Pacific albacore management, SC14 endorsed an initial focus on empirical based management procedures when developing harvest strategies for South Pacific albacore. Unlike the skipjack management procedure (MP) that applies a model-based estimation method, the MPs being tested for South Pacific albacore apply an empirical longline catch per unit effort (CPUE) indicator to drive the HCR. It is, therefore, important to test whether the simulated CPUE generated by the OM is a good approximation of observed CPUE. In particular, are the relative trends of the simulated CPUE consistent with the actual CPUE observed from the fishery and is there evidence that trends in simulated CPUE show any persistent retrospective bias that may indicate misspecification of the OMs?

This paper conducted a series of short-term stochastic CPUE projections from 2012 to 2016 using OMs based on data up until 2015, 2014, 2013, and 2012 (the procedure referred to as retrospective forecasting). The study showed that, although quite noisy, no clear retrospective pattern was detected among the CPUE projections, and that the relative levels of projected CPUE were consistent for the different fleets and with the historically observed CPUE for each fleet. These results are encouraging for progress towards evaluation studies over the coming year.

SC16-MI-IP-05: HCR design considerations for South Pacific albacore

This paper presents initial analyses of management procedures with alternate HCR designs for South Pacific albacore. Nine management procedures are evaluated, based on CPUE or mean length data.

CPUE based management procedures were also compared against proposed fixed catch reduction scenarios to achieve the albacore interim target reference point (TRP) in 20 years, as tasked by WCPFC15 (SC16-MI-IP-01).

The results suggest that the management procedures and HCR designs tested can potentially achieve the targeted CPUE or interim TRP. However, there are choices to be made regarding aspects of the HCRs that determine how reactive they are and how strongly they reduce or increase catches, with implications for catch stability. Further work is required to improve the generation of simulated length composition data. Overall results demonstrate a fully operational MSE framework for South Pacific albacore and a range of HCR options that can continue to be developed as part of testing candidate management procedures.

SC16-MI-IP-11: Report of the second external MSE technical review: Developments in the SP-ALB MSE framework

At the request of the Oceanic Fisheries Programme of the Pacific Community (SPC-OFP) an external review was conducted in 2020 of the work undertaken to develop the Harvest Strategy approach for WCPFC stocks and fisheries. The review was conducted by Dr Iago Mosqueira of Wageningen Marine Research (Netherlands) and focussed specifically on the ongoing work for South Pacific albacore tuna. Dr Mosqueira has considerable experience in the technical elements of MSE through his involvement in several international fishery management organisations including the IOTC, SPRFMO, NAFO, the European Commission and STECF.

The review addressed many of the technical elements of the work regarding OM conditioning, simulating CPUE indices, the design of HCRs, and also made recommendations for the design and development of the software used to conduct the evaluations. The review concluded that the technical framework for SP albacore is appropriate and the range of scenarios considered for the OM grid included the key sources of uncertainty. It was recommended that additional work be focussed on development of the robustness set and on sensitivities to future CPUE variability. These and other recommendations made will be a focus for future work.

Mixed fisheries

SC16-MI-IP-06: Further consideration of the mixed fishery management strategy evaluation framework for WCPO tuna stocks

Skipjack, yellowfin, bigeye and South Pacific albacore tuna are caught by an overlapping mix of fisheries in the WCPO. Management measures aimed at one particular tuna stock can therefore have impacts on others. An important consideration when developing harvest strategies for WCPO tuna stocks is to account for mixed fishery interactions. Review of alternative approaches for tackling this challenge was undertaken for SC15 where it was agreed to initially consider the 'multispecies modelling framework' (MMF). The MMF involves developing prospective single stock management procedures for skipjack, South Pacific albacore and bigeye respectively, in line with the agreed WCPFC harvest strategy workplan. The impact of these MPs on yellowfin would then be evaluated using a combined evaluation framework.

Based on recent catches, under the MMF approach, the catches of skipjack and South Pacific albacore would be largely managed through management procedures developed specifically for these stocks. The skipjack management procedure would also manage fisheries that catch large amounts of bigeye and yellowfin. This approach should be regarded as an initial attempt at considering multi-species and mixed fisheries interactions. If it is found to be unsuccessful, in terms of achieving objectives for the four stocks, alternative approaches will need to be developed.

The MMF will allow the calculation of a range of performance indicators, including those that relate impacts on stock status and catches to changes in fishing pressure from the individual single stock management procedures. For example, indicators can be developed that evaluate the impacts on the yellowfin and bigeye stocks and catches from changes in purse seine fishing pressure that would be managed through the skipjack management procedure. It will also highlight issues of disproportionate burden by considering performance indicators such as PI 5, in paper ***SC16-MI-IP-02***: *Take into account the special requirements of developing states and territories.*

Implementing the multispecies modelling framework presents several technical challenges, however, it is expected that these challenges can be addressed. Several assumptions will need to be made to run future simulations, in particular how archipelagic waters are considered and possible redistributions of fishing effort. It is important that these assumptions are clearly defined and presented to stakeholders in a transparent manner, and this will require SC and WCPFC advice.

The next phase of work on the multispecies modelling framework will be to start building the model framework, with the OMs for bigeye and yellowfin tuna being based on the 2020 MULTIFAN-CL assessments, and the previously developed OMs applied for skipjack and South Pacific albacore.

Model diagnostics

SC16-MI-IP-07: Developing a common set of diagnostics and outputs for MULTIFAN-CL based stock assessments

Model diagnostics and outputs are important to allow exploration of the robustness of stock assessments performed using integrated assessment frameworks such as MULTIFAN-CL. SC15 discussed the need for diagnostics and model outputs to be made available for all conditioned OMs in the skipjack MSE grid. This request led to consideration of a broader need for a tractable approach to present model diagnostic information for tuna and tuna like stock assessments. Model diagnostics and outputs can involve many plots and tables and as such providing complete sets within papers or reports is unwieldly. This paper describes the development of a new app (using R-Shiny) to allow easy selection and investigation of various typical model diagnostics and outputs. Feedback on the demonstration version of this app is sought from the SC. Members are encouraged to explore the app available at: http://ofp-sam.shinyapps.io/hierophant and provide feedback to the authors.

2. Engagement and capacity building

In 2019 to early 2020, prior to the COVID pandemic, the MSE project team visited eight member countries to provide training in harvest strategies and MSE. This added to the training activities in three PICTs in 2018. A total of 170 regional fisheries staff, from 11 PICTs have now had some form of training in harvest strategies and MSE. Other opportunities to build regional understanding of this work have occurred at meetings of sub-regional organisations and other training activities (i.e. Stock Assessment Training Workshops run by SPC). The first Pacific Island Fisheries Professional to work on the MSE project has almost completed her one-year placement.

The COVID situation has impacted our progress in this area, and we are in the process of transitioning to remote/online training approaches. We are in planning with Tuvalu as the first PICT to trial this approach. Increasing the involvement of DWFN (Distant Water Fishing Nations) is also a priority for the coming year, but planned overseas travel is no longer possible. Tailored e-meetings/training workshops are now being considered, with the first e-meeting having been conducted with Japan in early July.

3. Key decisions required to further progress the development of harvest strategies within WCPFC.

As drivers of the harvest strategy process, fishery managers and the wider stakeholder group need to define key aspects of the process. In general, the Scientific Committee will need to consider more technical issues relating to the evaluation and testing of candidate management procedures whilst the Commission will need to consider the overall objectives for the fishery, methods for selecting the 'best performing' management procedures and approaches for implementation. There will, however, be considerable overlap in the issues addressed by the two bodies and discussions around many of these key decisions will need to involve both scientists and managers. Approaches for these discussions, and mechanisms to select and adopt management procedures remain to be considered, given that a 'science management dialogue' has not progressed.

At the 15th WCPFC meeting in 2018 the SPC project team provided a paper on *"Key decisions for managers and scientists under the harvest strategy approach for WCPO tuna stocks and fisheries"* Link. This important paper provided a concise and clear direction for managers and scientist to consider critical aspects and decisions required to progress the harvest strategy work. The tables at the end of this document revisit the 2018 paper and review the progress to date and the related papers for the key areas noted.

4. Summary

The last year has seen significant progress in the technical aspects of the harvest strategy workplan, with the skipjack and South Pacific albacore MSE work progressing to the stage of initial evaluation studies to inform decisions on management procedures. Refinement of modelling frameworks and further testing will continue. Greater input will be required from SC and the WCPFC to provide advice on a number of issues including TRPs, HCR design, and importantly, the development of '*agreed procedure(s) for selection of the 'best performing' management procedure'*. While the need to develop an approach for implementing any agreed management procedure is largely the responsibility of the managers and stakeholders, it will no doubt require scientific input to explore fishery/country specific implications of alternative implementation approaches.

To facilitate progress from technical development to adoption and eventual implementation will clearly involve consideration of trade-offs among objectives, and SC16 consideration of mechanisms to support the dialogue between scientists and managers is encouraged.

The multispecies modelling framework will soon move from concept to MSE model development. The MSE project team is moving forward with the approach endorsed at SC15, however, further communication and education on the approach will be required.

2018 key decisions/advice areas (from WCPFC-SC14-2018/ MI-WP-05)

The Commission

Decision/advice areas	**Progress/papers**
An agreed procedure for selection of the 'best performing' management procedure	Limited progress on agreed procedure, online presentation/exploration tools developed i.e. PIMPLE app. *SC15-MI-WP09*
Approach for implementing the agreed procedure	No formal progress
Adopting Target Reference Points (TRPs) that define desirable states of a stock and fishery;	Interim TRP for South Pacific albacore Interim TRP skipjack *WCPFC15-2018-SPalbTRPSWG_01, CMM2018-01*
Definition of fisheries and fishery controls within the harvest strategy	Not formally defined across all fisheries
Input into candidate harvest control rules (HCRs)	Some progress, but can now move forward with skipjack and albacore MSE frameworks, and apps for exploring evaluations of different HCRs will help. *SC15-MI-WP09*
Feedback on presentational approaches to enhance decision making	Harvest strategy engagement tools, feedback from training workshops *SC15-MI-WP09*
Development of the monitoring strategy	Monitoring strategy progressed for skipjack, SC16-MI-IP02
Definition of exceptional circumstances	More work to define these, robustness uncertainty set proposed and exceptional circumstances discussed for skipjack *SC15-MI-WP06*

The Scientific Committee

Decision/advice areas	**Progress/paper**
Operating model (OM) refinement and development	OMs developed for skipjack and albacore. *SC14-MI-WP03, SC15-MI-IP02, SC16-MIIP08*
Define candidate estimation methods (EMs)	Model based estimation method developed for skipjack and empirical CPUE based for albacore. *SC15-MI-IP02, SC16-MI-IP09*
Refine and evaluate performance indicators	Candidate performance indicators developed *SC14-MI-WP04, SC15-MI-WP-03*
Provide advice on scientific aspects of candidate HCRs	Progress reviews, and key decisions papers *SC15-MI-WP05, SC16-MI-IP03*
Support TRP definition	Skipjack, yellowfin and bigeye TRP projection work *SC15-MI-WP_01, SC16-MI-WP02*
Review approaches to support the monitoring strategy	Expert planning workshop, skipjack monitoring strategy paper SC12-MI-WP05, SC16-MI-IP02
Evaluate economic indicators	Limited progress on explicit economic indicators, but these are not output from the MSE framework, proxies are considered *SC14-MI-WP04*
Evaluate exceptional circumstances	More work required on this, some discussion in planning workshop, needs management/stakeholder advice *SC12-MI-WP05*
Develop multi-species approaches	Conceptual approaches explored, multi-species approach endorsed, moving to model development stage. *SC15-MI-WP04, SC16-MI-IP06*