



**SCIENTIFIC COMMITTEE
NINETEENTH REGULAR SESSION**

Koror, Palau
16-24 August 2023

Options to address time challenges in the SC review of WCPFC stock assessment inputs
WCPFC-SC19-2023/SA-WP-14 REV1

16 June 2022

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Revision 1. One addition to the options table (option # 14) on the potential to swap the timing of SC and TCC meetings (TCC in August, SC in September)

1. EXECUTIVE SUMMARY

Following discussions at SC18 on the perceived limited time available to review and provide feedback on key assessment inputs, that meeting's report tasked the SSP to develop a discussion paper on the issue to inform SC19.

The timetable to produce WCPFC 'key tuna' stock assessments and other regular SC papers is influenced by:

- The annual SC-agreed stock assessment schedule;
- The 30th April data provision deadline, defining the availability of catch, effort and size composition data, and the subsequent period of data loading and verification;
- The dates of the SC meeting and hence deadline for SC papers;
- The delivery of the cumulative requests for additional regular reporting following the data provision deadline, to which resources must be allocated.

Noting these constraints, this paper highlights some of the issues to be considered by SC, including the need to work with other CCMs and regional partners to deliver specific data inputs, limitations in the resources available to the SSP and regional partners, the need to ensure equal opportunity within any input review framework, and the challenges in implementing any feedback received via early SC review within the timeframe available for annual assessments.

The paper presents candidate options that could provide the desired additional time for Scientific Committee review of input analyses prior to the SC meeting, along with perceived pros and cons. The ideas represent those of the SSP and are not exhaustive. The options take the view that additional 'time' could be created by:

- changing existing deadlines;
- adjusting the level of work undertaken;
- extending the period over which work is undertaken;
- increasing resources available.

Some of these may be considered impractical, ineffective, or undesirable, but have been included for completeness. Ideas are not mutually exclusive - adopting more than one approach may further enhance the time available. We suggest that approaches should apply to all assessment inputs being presented to the SC to ensure consistency and enhance SC's ability to evaluate the assessment being considered. Furthermore, any ideas trialled should be subject to review.

2. INTRODUCTION

Following discussions on the issue at SC18, Paragraph 103 of that meeting's summary report noted "...the challenge of fully reviewing the key inputs into WCPFC stock assessments and providing feedback within the time available. SC recommended that approaches that may address this issue be discussed at SC19 and recommended that the Scientific Services Provider (SSP) develop a discussion paper to inform those discussions".

This paper highlights the current challenges in the development of the regional tuna stock assessments and their inputs and provides some considerations and options to the 19th Scientific Committee to inform its discussions on the perceived issue.

We note that the focus of the discussion was on reviewing key inputs into the assessment, rather than on changes to the assessment approach itself. However, these elements are inter-related and have similar constraints. Under the current approach, SC's review of and recommendations on the approaches used to develop inputs to assessments and the approach taken within an assessment, are incorporated within the subsequent scheduled stock assessment(s). This does delay potential improvements to the overall assessment approach.

Following the retirement of the lead developer of MULTIFAN-CL (Dave Fournier), developments to the software are envisaged to be less extensive than in recent years. Implementation of appropriate 'new features' within tuna assessments are likely to be primarily those already adopted by SC for other assessments in recent years, as endorsed by the recent independent review of the 2020 WCPO yellowfin tuna assessment ([SC19-SA-WP-01](#); e.g. the catch conditioned approach, alternative approaches to weighting of size composition data, conditional age at length when reliable age data are available, etc.). However, further recommendations made in that review may lead to some additional changes in the approach to developing assessments and their key inputs (e.g. treatment of tagging data, development of CPUE indices, biological inputs) over time, of relevance to this discussion. Furthermore, given the reduced capacity for ongoing development of MULTIFAN-CL, consideration and testing of alternative modelling frameworks, and/or development of more refined modelling software based on MULTIFAN-CL will be required in the coming years.

3. CURRENT ARRANGEMENTS AND PRACTICAL CONSIDERATIONS

The timetable to produce WCPFC 'key tuna' stock assessments and other regular SC papers is influenced by some specific parameters:

- The annual stock assessment schedule as agreed by SC each year, defining which and how many assessments are to be undertaken;
- The data provision deadline of 30th April, as specified in the 'Scientific Data to be provided to the Commission'²;

² Note this is the deadline for catch, effort and size composition data provision. This does not represent the time at which data become available to the assessment scientist. Data must first be loaded into SPC data systems. As data sets are not supplied in a standardised layout/format, they typically require specific loading scripts for each country, each of which may need to be updated if the layout/format of data provided differs from that provided in previous years (for that country). Errors and uncertainties within the data that are noted during subsequent verification then need to be cleared with the relevant CCM. Generally, updated data sets have been available for assessment work before the end of May each year. Subsequent data preparation is then needed to develop inputs to the assessment.

- The dates of the SC meeting³ and hence deadline for papers to be provided for the Scientific Committee, as detailed in the relevant SC Meeting Notice – 18 days in advance of the start of the meeting;
- The delivery of the cumulative requests received at successive SC meetings for regular reporting of further information following the data provision deadline (for example, expansion of the GN-WP-01 paper, South Pacific albacore ‘trends’ paper and ‘indicators’ paper, to name a few) for which resources must be allocated.

The WCPFC science data provision deadline primarily influences the availability of catch and effort (and hence CPUE) and size composition data. This deadline particularly affects the skipjack stock assessment, where the most recent year ($y-1$) is included within the assessment to maximise the information available for this comparatively short-lived tuna stock. This is more feasible given that the major fishing gears do not remain at sea for long periods. For those tuna assessments incorporating significant amounts of longline data, the last year of the assessment is usually a year earlier ($y-2$). This reflects lags in receiving data from vessels that may be at sea for long periods. However even in these cases, updates to longline data sets for recent years may be received late in the year prior to that in which the assessment is performed ($y-1$), which influences the time at which supporting analyses can be based on the ‘finalised’ data set. Indeed, updates to data for previous years ($y-2$, $y-3$, $y-4$, for example) are often provided in the 30th April data submissions in year y , and it is very important that data for these years are included in those used for the assessments - probably more important than the inclusion of data for the most recent calendar year ($y-1$). Due to the time loading and checking the latest data provision, analyses developing assessment inputs and the assessment model runs themselves will not use these updated data (data for $y-2$, $y-3$, etc.) until late May at the earliest (as an example, in 2023 this has been more like mid-June).

Analyses for some assessment inputs could begin prior to the data submission deadline, with those analyses being subsequently updated as required once finalised data were available, to assist early SC review. As data updates generally affect the last few years of the time series, it might be hoped that the impact on the overall input series would be constrained to that period. However:

- Human resources available currently to the SSP limits the practicality of this approach. Those resources are dedicated to the next assessment(s) in line, with currently limited scope to ‘get ahead’ of the assessment schedule. Practical issues of staff turnover, and time spent training new staff on the assessment approaches, are also recognised by the SSP.
- In terms of timing, (preliminary) analyses must be run and described, and outputs - including diagnostics where needed - reviewed by SC members in time for any changes to be incorporated by the assessment scientist prior to the production of the assessment paper to the SC meeting of that year. While the production of preliminary analysis outputs may be streamlined, it represents an additional burden on the assessment scientists, while analyses may need to be re-run, and new outputs formulated, based on the finalised data set and any appropriate inputs resulting from the early SC review.
- Some key data sets are not directly accessible to SPC scientists, the most notable of these being the Japanese pole and line fishery operational data that is used to generate CPUE abundance indices for both the skipjack assessment and the estimation model of the interim skipjack management procedure. Due to national constraints, analyses of these data are done

³ A move to change the dates for the Scientific Committee meeting would need to consider – amongst other things - not only the timing of the subsequent WCPFC subsidiary body meetings and regular session and the levels of work required for analyses based on SC outputs between SC and those meetings, but also the international meeting calendar.

by Japanese scientists in collaboration with SPC scientists either remotely or in Japan, which can extend the period needed for the development of this key input and for the collaborative work enhancing the modelling approach. Development of an MOU with Japan for SSP access to pole and line operational level data for stock assessment purposes, similar to that for longline data, would assist in this collaboration. The implications of decisions on timing for the workloads of CCM scientists and other regional partners should also be recognised.

In theory, some other key assessment inputs (e.g. growth, maturity, conversion factors, tagging) can be developed in advance of the WCPFC data provision deadline, particularly since some of these estimates are assumed to be time-invariant within the assessment, and if no new data have become available require minimal work. However:

- Timetables may be influenced by SC funding cycles, with specific supporting analyses (e.g. development of updated growth estimates, conversion factors etc.) requiring agreement of an SC budget at the Commission meeting at the end of the year. Enhanced SC budget planning, aided by a formally adopted Tuna Assessment Research Plan process, would assist here.
- As noted above, there are limited additional SSP human resources currently available to dedicate to work alongside the immediate assessment schedule. Dedicated staff resources to focus on analyses to improve and prepare input data sets and biological parameters would also free up the assessment leads to focus on model development and improvements based on recommendations/suggestions from previous SCs and peer reviews.
- Dependent upon the assessment, the input of regional partners (and IATTC where a pan-Pacific assessment is scheduled) may be needed to deliver assessment inputs: e.g., provision of standardised CPUE time series; estimates of growth; tagging data sets; etc. Therefore, the timetable to deliver assessment inputs and their implications for assessment outcomes well in advance of the SC meeting is not fully within the control of the SSP, and as noted above changes may have implications for CCM scientists and other regional partners.

The mechanism through which any preliminary analyses might receive 'early' SC review also needs to be considered. Ensuring equal opportunities across the SC membership to review preliminary outputs will be important.

A current key planning meeting within the regional assessment framework for the four 'key tuna' stocks is the SPC 'Preparatory Workshop for Stock Assessments' (more commonly the 'Pre-assessment workshop' or PAW). An SPC technical meeting, this allows the SSP to present its current thinking on data and analyses for the assessments to be performed that year, so that input and advice can be gained from the region's scientists. This meeting is generally held in April, prior to WCPFC data submission deadlines and the ultimate development of many of the key input data sets and related analyses. PAW suggestions may not be carried through to the final assessment if subsequent investigations find they are too time intensive or result in what are considered to be unrealistic assessment outcomes. The PAW meeting may not therefore be consistent with the specific desire of early SC inputs review. In turn, as a non-WCPFC meeting, physical attendance at PAW is limited to those that can access funds to travel to and stay in Noumea, although the increased use of 'hybrid' approaches to meetings may mitigate this.

Exceptionally, a one-off 'online PAW' has been held to discuss key changes in assessments, for example following the finalisation of updated estimates of bigeye growth and preliminary analysis of the implications of that new input data for stock assessment outcomes. However, this has not been a routine event given it placed further burden on otherwise extremely occupied assessment scientists.

The independent review of the recent WCPO yellowfin tuna assessment noted some specific recommendations that will provide greater clarity in the reporting of assessment model changes, and their impact on the assessment results as part of the stepwise analysis. The review suggested developing clearer stepwise transitions between the previous assessment and the ‘diagnostic case’ model for the latest assessment. While this represents additional time required for the assessment development process, this should assist SC in understanding the implications of changes to the assessment and data inputs. This will be an aim of future assessment reports. Furthermore, new developments/key changes within assessments are generally highlighted through the provision of a separate Information Paper, or as a specific section within the assessment paper. Ensuring greater clarity in the reporting of these changes, and their impact on the assessment result as part of the stepwise analysis, will also be an aim of future assessment reports.

The yellowfin assessment peer review also recommended that analysts be given more time/greater resources to ensure fuller model exploration, a valuable recommendation that is not necessarily compatible with current constraints.

4. OPTIONS FOR PROVIDING ADDITIONAL TIME FOR SC REVIEW

Candidate options that could provide the desired additional time for Scientific Committee review of input analyses prior to the SC meeting are provided in the table below, for discussion. The ideas represent those of the SSP, and additional ideas may be captured. Some of these may be considered impractical, ineffective, or undesirable, but have been included for completeness. The rows in the table are not mutually exclusive - adopting more than one approach may further enhance the time available. The options take the view that additional ‘time’ could be created by:

- changing existing deadlines;
- adjusting the level of work undertaken (assisted by the need to ‘simplify’ assessments noted in previous years);
- extending the period over which work is undertaken;
- increasing the resources available.

We suggest that the ultimately agreed approach should apply to all inputs to assessments being presented to WCPFC SC, to ensure consistency in the information being presented and hence enhancing the ability of Scientific Committee members to evaluate the assessment being considered.

In turn, if implemented, given that there is no guarantee that the options suggested below will achieve the desired results, the efficacy of any SC-determined changes should be under trial and reviewed.

No.	Adaptation option	Benefits	Drawbacks
1	Move data provision deadline from end April to earlier in the year (and maintain/move SC meeting timing (#4)).	Gives more time for supporting analyses to be performed, reviewed, updated.	Most recent year of data unlikely to be included in the assessment (SKJ) unless option #2 also pursued. Later-in-the-year updates to e.g. longline data may limit supporting analyses for all assessments. Could affect indicators/SPA trends papers etc. similarly.
2	Provide data more frequently throughout the year. For example, propose an additional data submission deadline for earlier in the year (e.g. end of February) to cover: (i) submission of updated ACE and AGGREGATE data for previous years (y-2, y-3, y-4, etc.), and (ii) submissions of ACE, AGGREGATE and SIZE data for (y-1) for the purse seine and other key fisheries for skipjack. (see discussions arising from the ER&EMWG on data provision at WCPFC19).	Allows supporting analyses to be initiated earlier. Internal automatic checking on data entry should improve data quality and reduce manual checking processes. Data from the purse seine fishery are available in a more timely manner than other fisheries and would assist skipjack assessments in being as up to date as possible. Updates to data from previous years (y-2, y-3, y-4) should usually be available for this earlier deadline to assist in assessments for other stocks.	Region-wide and consistent adoption of ER required. Data checking processes need to be undertaken rapidly. Improves ability to undertake analyses by 2 months only.
3	Adopt mechanisms for more efficient data provisions, including: - Guidelines for standardised structure/file layouts for Annual Catch Estimates and aggregate catch/effort data are used by countries to submit their data. - Consideration of a new portal/app on the WCPFC web site for CCMs to enter/edit/manage their ACE data submissions.	Saves time on loading and checking the data submission into the WCPFC databases. Approach is consistent with the requirement to submit standardised operational catch/effort and observer data according to the WCPFC ER SSPs and the recent update to the Scientific data to be provided to the Commission (ANNEX 2).	Some initial work required by CCMs to change data submission formats, although the WCPFC SSP would assist CCMs to work towards any new requirements.

4	Move SC later in the year (and maintain/move data provision deadline (#1)).	Allows data provision up to the most recent year to be incorporated within (SKJ) assessment (if data provision deadline maintained; but see also #2, #3). Gives more time for supporting analyses to be performed, reviewed, updated.	Limited time for subsequent further analyses prior to that year's Commission meeting (e.g. during TT CMM years, for harvest strategy analyses, where managers require advice based upon SC outputs).
5	Move deadline for data input papers specifically earlier in the year.	Would provide greater time for SC feedback on input analyses.	Analyses undertaken early in the calendar year may not be updated with the latest information if the data deadline were not pushed earlier (#1). Current limited human resources available to undertake analyses well in advance of the assessment year and provide outputs for review. Additional burden on assessment scientists to re-run analyses once finalised data/suggested changes received. If data provision deadline maintained, analyses may need to be reduced and assessments simplified to achieve the deadline. Feedback on analyses would need to be rapidly received, as they may not lead to changes if the time available prior to the assessment finalisation were insufficient.
6	Increase resources to the SSP to provide additional person-power to deliver outputs.	More resources allow additional work to be performed, earlier in the year. For example, an additional staff position dedicated to data preparation and analysis and the development and maintenance of streamlined approaches for assessment reporting and repeatability. This would also help mitigate the time lost in inevitable staff turnover and the associated training and development requirement that typically must occur of new assessment staff.	Still constrained by the existing data/paper deadlines. Feedback on analyses would need to be rapidly received, as they may not lead to changes if the time available prior to the assessment finalisation were insufficient. Implications for SC budget.
7	Develop tools for more efficient review and feedback	Online tools such as GitHub and R Shiny apps allow interested regional scientists to view data	This approach requires staff resources to step away from assessment work to create, structure and

		inputs as they are produced. This could also extend to standard plots for model development and diagnostics. Can provide up to date information on assessments as they develop, rather all information being received close to the SC meeting. Perceived issues could be communicated directly to the SPC assessment scientists for wider consideration.	populate tools and repositories in the initial stages. The tools would need to be easily accessible by all interested regional scientists. There is a risk that this type of more real time 'view/review' could lead to specific influences on assessments, without wider SC review. Requires time allocation by SPC scientists to keep up with feedback/comments and respond to these if necessary. There would be a need to be selective in the information provided to avoid representing a 'branch' of the assessment development process that is subsequently abandoned due to issues. Housing of the apps incurs some costs based upon the number of users/views/bandwidth levels required.
8	Reduce number of assessments performed each year.	Allows more assessment scientist time to be brought to bear on the assessment with existing resources. Reduces the volume of information/papers SC needs to review.	Without an increase in SSP funding to allow more scientist-time per assessment (#6), there would be a reduced number of assessments performed, the frequency of assessments for a stock would be reduced, and status advice for a stock developed less frequently.
9	Move to a cycle of 'update' and 'full' assessments	Allows more focus on one assessment each year (dependent upon the cycle period). Allows SC to focus their review on the 'full' assessment that year.	'Update' assessments do not necessarily allow the 'best available scientific information' to be developed. Ongoing improvements to assessments would not be actioned for all stocks in a timely manner. This approach may not be consistent with the use of the assessment as part of the harvest strategy/s monitoring strategy
10	Extend the period over which tuna assessments are performed to two years (as per recent decision for shark assessments).	Allows greater time to perform input analyses, receive SC review, then perform the assessment. Assessments would be of comparable rigour to that currently provided.	Dependent on approach, if analyses were not re-run, it could increase the lag in the data relative to the year in which advice is provided by 1 year (to 2 to 3 years historically). This is significant, particularly for skipjack tuna where most of the population will not

	For example, perform a "preliminary assessment" that may be more focussed on structural and modelling changes, rather than data changes. Following SC review in the first year, that structure could then be fixed and a data update applied for the year 2 assessment.		<p>have been 'seen' within the assessment being considered.</p> <p>If SC's review 'set' the approach for data input development in the prior year, it would still increase assessment workloads under the current assessment cycle, as analyses could still need to be re-run with finalised data – particularly if issues were then identified - and reports re-written.</p> <p>Improvements to assessment inputs due to learnings from other assessments/reviews would be delayed by a year.</p> <p>Appears to provide little gain over the current approach where SC inputs to a data input approach in one year are adopted for the next assessments in line.</p>
11	Reduce analyses/representation of uncertainty (size of the grid) in assessments and/or model diagnostics presented.	<p>Assessment and assessment report production would be faster, providing more time post SC review.</p> <p>Saves SC some time spent in review of SC documents.</p>	<p>Does not significantly assist in the earlier delivery of input data analyses for SC review.</p> <p>Reducing grid size would result in a limited gain in personnel time.</p> <p>A grid with fewer uncertainty factors might not represent the full uncertainty and could thus underestimate the actual risk of unwanted management outcomes.</p> <p>Reduction in diagnostics will provide a slightly greater gain in time but reduce transparency and utility.</p> <p>Does not assist in the review of assessment inputs, which may inform uncertainty grid structure.</p> <p>Assessments may not continue to meet global 'best practice' or 'good practice' guidelines.</p>
12	Improve planning of SC budget so that funding to support specific inputs does not delay their production.	Allows work on specific inputs to be started well in advance of the assessment being considered.	Only applies to specific (generally biological) assessment inputs, not those based on fisheries data.

13	Reduce the overall scope of issues considered across SC.	Reduces review workload of SC members allowing them to concentrate on assessments.	Reduces the ability of Scientific Committee to cover the range of topics for which advice is needed. Potentially slows down the incorporation of advice in management action.
14	Switch the timing of the SC and TCC meetings (TCC in August, SC in September)	Provides more time post data deadline to develop the stock assessments. Minimises the impact on the global meeting calendar	Limited time for subsequent further analyses prior to that year's Commission meeting (e.g. during TT CMM years, for harvest strategy analyses, where managers require advice based upon SC outputs). Impact on the preparation and activities of TCC needs to be considered.