SCIENTIFIC COMMITTEE
FIFTEENTH REGULAR SESSION

Pohnpei, Federated States of Micronesia
12-20 August 2019

Report from the SPC pre-assessment workshop, Noumea, April 2019

WCPFC-SC15-2019/SA-IP-01

Graham Pilling[1] and Steve Brouwer[1]

[1] Oceanic Fisheries Programme, Pacific Community (SPC), Noumea, New Caledonia

Report from the SPC pre-assessment workshop, Noumea, April 2019

Oceanic Fisheries Programme, Pacific Community (OFP, SPC)

Introduction

To help undertake stock assessments for the WCPFC, the Oceanic Fisheries Programme (OFP) of the SPC has sought input from stock assessment scientists in the region through the SPC pre-assessment workshop process. The eleventh pre-assessment workshop was held in Nouméa, New Caledonia, from the 2-5th April 2019.

Twenty two scientists from fifteen organizations participated in the workshop, along with SPC staff. A list of participants is provided in Appendix 1.

Graham Pilling (OFP, SPC) opened the meeting and welcomed the participants. The agenda focused on approaches for the stock assessments of WCPO skipjack tuna, SW Pacific striped marlin and WCPO Oceanic whitetip shark, developments to the MULTIFAN-CL modelling framework, technical developments in WCPO Management Strategy Evaluation and related activities to progress the WCPFC harvest strategy work plan. Presentations were invited from all participants, with the majority made by SPC staff. The meeting operated under the terms of reference provided in Appendix 2, and was chaired by Steve Brouwer of the OFP Stock Assessment and Modelling section.

This report briefly describes the various presentations made and focuses on important issues discussed by participants, and specific suggestions made. The report does not attribute comments to countries except where the comment related to the agreement to provide data or to undertake particular analyses. The relevant stock assessment scientist will address the recommendations provided in this report to the extent possible. It must be noted that the extent to which suggestions can be incorporated into the modelling prior to WCPFC SC will in particular be constrained by the ability of the model to converge under the assumptions required.

The outcomes of this meeting will be reflected in the papers submitted to WCPFC-SC. Copies of presentations prepared by SPC can be provided on request.

Operational CPUE data analyses

Nicholas Ducharme-Barth (OFP, SPC) presented the results of a simulation study of CPUE standardisation approaches. The approach compared the outputs of 'conventional' delta-GLM models to geostatistical models (using VAST), by modelling CPUE data consistent with that of pole-and-line fisheries to be used within the skipjack stock assessment. Conventional models performed reasonably well where spatio-temporal shifts in fishing locations were not extreme, but geostatistical models performed better when those shifts occurred, under the assumption that abundance in non-fished cells remained comparable to that of the past. The ability to estimate changes in catchability over time were influenced by the spatial distribution of data in both approaches.

The workshop asked why the geostatistical model might perform better than the conventional approach where there was a spatial reduction in fishing effort. It was thought that as the geostatistical approach incorporates stationary spatial correlations, it allowed the underlying abundance in non-sampled regions to be predicted. This assumed that the reason for the reduction in fishing at the margins was due to an economic influence, rather than a localised reduction in abundance that led to fleets moving to areas of higher abundance. As a result, the reasons behind spatial changes in fishing locations should be investigated. The workshop noted that estimated catchability changes were quite abrupt, and that both the conventional and geostatistical models struggled to estimate this. It was also noted that the SEAPODYM model used to simulate the underlying population was influenced by oceanographic variables. Within the standardisation model, a linear effect of sea surface temperature (SST) on CPUE was assumed, although more complex effects could be added. The workshop noted that while the absolute value was used in the current modelling, the level of any anomaly from e.g. the long-term mean could also be used. Finally, the workshop discussed the approach used to simulate zero catch events. The approach used was to set 10% of cells to zero, where the likelihood of a cell being selected was inversely proportional to underlying abundance.

Skipjack assessment

Matthew Vincent (OFP, SPC) summarised the inputs to and outcome of the 2016 stock assessment for WCPO skipjack and the additional work SPC performed after SC12 investigating alternative spatial structures and forms of assumed natural mortality. He also presented the proposed approach for and progress towards the 2019 WCPO skipjack stock assessment, including CPUE standardisation approaches, catch inputs, tagging data, an alternative spatial structure, and functions of natural mortality.

The workshop noted the recurring issue of tagging groups hitting the bounds within the MULTIFAN-CL model, and asked whether there were plans to look into this in more detail. Following discussion, the workshop suggested reporting the occurrence of this in the sensitivity analyses performed, as well as examining the impact of adjusting the bounds. SPC noted that the upper bound had been modified within the bigeye assessment as part of a sensitivity run.

The workshop asked whether the predicted increasing trend in unfished biomass seen in the 2016 assessment was linked to the tagging data. SPC responded that the cause of the trend was not certain, but might also be related to the CPUE index. This could be examined further.

The workshop noted there was relatively little contrast in the input CPUE series to inform the model. Previous assessments showed that estimates of the scale of the biomass were reliant on the available tagging data, and that without that data the skipjack model was very unstable. Tagging data were therefore very influential to cap model estimates of biomass.

The workshop suggested:

- **Reporting the incidences of tagging groups hitting the bounds in the sensitivity runs performed within the 2019 assessment, and investigate the impact of changing the bounds on model outputs.**

Biological assumptions and growth

Matthew Vincent summarised the biological assumptions being considered for the 2019 assessment. This included the re-development of MULTIFAN-CL to incorporate maturity at length (rather than age), as well as examining patterns of maturity, sex ratio, growth, and length-weight data.

Sex ratio at length was discussed, noting that over the limited range of sizes for which SPC had data, there was some evidence of a shift toward males at larger sizes. The workshop discussed the potential mechanism behind any such change in sex ratio toward males at larger sizes, including higher natural mortality for females after reaching maturity. The workshop noted that the Japanese data on sex ratio (see below) could span a much larger size range than that available to the SPC. Further work on that data set during the workshop indicated that both for regions combined and for the tropical region only, a 50:50 sex ratio held over much of the size range. The workshop therefore agreed that the sex ratio at size assumed within the skipjack assessment model would remain at 50:50.

Estimates of the length-weight relationship were discussed, with the length-weight data available from the PTTP tagging programme being particularly variable. It was noted that IATTC adjusted their length measurements given a difference between fresh fish and those measured after freezing or subject to rigor mortis. SSAP measurements were mainly from fresh fish while port sampling measurements would be of frozen and/or thawed fish. If feasible, there is a need to standardise for one measurement or another, noting that the size composition will largely be from the frozen/not fresh category, but fish release at tagging will be fresh. The workshop noted the availability of length-weight data from the Japanese pole and line fishery and suggested the incorporation of these data into the model.

Discussion on the estimation of growth clarified that all parameters were currently being estimated within the MULTIFAN-CL model. Challenges estimating the standard deviation at length were noted, with a larger SD at smaller sizes being estimated compared to larger fish, i.e. the opposite of what might

commonly be expected. It was noted that at younger age classes, the range of lengths may be larger in skipjack, and might lead to this effect.

Hidetada Kiyofuji (National Research Institute of Far Seas Fisheries (NRIFSF), Japan) presented the results of studies into the growth and maturity schedule of skipjack tuna in tropical and temperate regions of the WCPO. Growth was estimated using otoliths and gonad samples used to identify maturity stage.

Differences in estimated age occurred dependent upon the approach used to prepare and read the otoliths (counts from sectioned and whole otoliths). Noting challenges in ageing older skipjack individuals, an approach combining otolith readings for small fish with tagging information for larger fish was being pursued, using a high confidence tagging data set. This work was ongoing, and could in future assessments provide information to be considered as a growth-related axis of uncertainty. In the current assessment, the workshop agreed that growth would be estimated within the MULTIFAN-CL model.

The workshop discussed whether all available data should be used to estimate the maturity-at-length for the assessment, or whether data only from the tropical region should be used. It was noted that in the 2016 assessment, around 12% of the biomass estimated within the diagnostic case model was in temperate Region 1. The potential to weight the information by the estimated abundance of fish within the major regions (tropical, sub-tropical, temperate) was also discussed. Ultimately the workshop recommended using only the tropical region data to estimate the maturity schedule, with an abundance-weighted estimate of maturity to be developed and used within a sensitivity analysis.

The discussion on batch fecundity focussed on whether the available data implied a notably different exponent to the current implicit assumption within MULTIFAN-CL that fecundity was proportional to body size, and hence represented by the exponent of the length-weight relationship. The presence of some low batch fecundity estimates for larger fish, which may represent post-spawning condition due to the presence of regressing oocytes was noted, and their removal from the data for estimation should be considered. The workshop also noted that spawning frequency and batch fecundity need to be combined to get a total fecundity estimate rather than the number of eggs per day. Ultimately the workshop suggested that the assumption of fecundity being proportional to body size was sufficient for the 2019 model.

The workshop suggested:

- **That skipjack growth would be estimated within the MULTIFAN-CL model**
- **Using the tropical region estimate for maturity data only within the model grid, with a one off sensitivity to be run where the maturity data are weighted across the three regions (tropical, sub-tropical, temperate).**
- **Given the similarities in the exponents of the batch fecundity and length-weight relationships, the effect captured within the length-weight relationship was considered sufficient.**
- **The sex ratio at size assumed within the skipjack assessment model remain at 50:50.**

- **The exclusion of tagging data and inclusion of Japanese pole and line data for the estimation of the length-weight relationship, and ensure that the measurement state (fresh/frozen) is considered if appropriate.**
- **The workshop also noted the ongoing work by Japan on the estimation of growth for skipjack, the approach of combining otolith and tagging information, and the potential to use this as an alternative growth assumption in future assessments (post 2019).**

Spatial structure and fisheries

Matthew Vincent presented the proposed spatial structure of the skipjack assessment and corresponding fisheries. The initial proposal was to maintain the structure from the 2016 assessment, with 5 regions, and the corresponding 23 fisheries. Minor changes to the inclusion of gears and fleets for the PL in region 2 and the Indonesian domestic fishery were presented. The potential alternative spatial structure for the assessment was presented, with 8 regions to account for suspected seasonal movement seen from size data, and differences in size seen in pole and line catches across the WCPO region.

Hidetada Kiyofuji presented some spatial analyses of size and CPUE data that informed discussions on alternative regional structures for skipjack. Size data in the northern region (original Region 1) indicated that dividing this region into two was appropriate to better capture movement, while moving the southern boundary of the northern region up to 30°N appeared to better capture the heterogeneity seen in size data. A shift of the tropical region boundary down to 10°N was also consistent with the approach for bigeye and yellowfin assessments.

The workshop was reminded of the historical development of the skipjack model spatial structure. The 2016 structure was part of the evolution over time, from a three region model that was modified following the bigeye review to five regions incorporating Region 5 (PNG/SB) for tagging purposes and Region 4 to encapsulate the ID/PH region.

Preliminary model results using the alternative regional structure indicated that the MULTIFAN-CL model struggled to estimate what was considered to be 'reasonable' biomass levels in new sub-tropical Regions 3 and 4. This may result from a lack of tagging information in those regions to provide the model with information to limit those biomass estimates. It was noted that regional scaling may be required to obtain a working MULTIFAN-CL assessment with this regional structure, based upon the relative CPUE levels (or geostatistical model outputs). These had not been considered necessary in previous skipjack assessments, given extensive tagging data for the larger regions of those assessments, but were routinely used for some other WCPO tuna assessments. The workshop noted that the traditional CPUE standardisation approach was unable to adequately estimate CPUE for some new regions (see below). SPC would continue to investigate the approach, but could not guarantee that the model would be suitable as the basis of advice by SC15. SPC would keep workshop attendees informed of progress through electronic means during the period before SC15.

The workshop suggested:

- **That based on the challenges encountered in developing the model with the alternative regional structure during preliminary runs, this model be investigated further, and that SPC inform workshop participants electronically on progress.**

Tag data

Yoshinori Aoki (NRIFSF, Japan) presented the Japanese tagging data available to the 2019 assessment, and the approach used to estimate individual release lengths where no information existed in historical data.

The workshop discussed the spatial distribution of tag releases, noting that in new model Region 5, many of the release events were close to the Region boundary, and hence movement out of the region may not be representative of the whole region. It was noted that similar issues arise with the RTTP and PTTP tagging programmes for some Regional boundaries.

The approach used to estimate fish length at release was also discussed. The workshop suggested that instead of assigning a mean length of the measured catch to the release group, individual fish could be assigned a random size from that release group size distribution to take into account the actual distribution of release sizes (and hence potentially reduce bias where the size distribution is skewed). The random seed used to develop the release length would need to be retained for repeatability. It was noted that MULTIFAN-CL would assign mean length at release into different age classes based on the variability in length-at-age.

The workshop discussed which Japanese tagging data set to include within the skipjack model. In the 2016 assessment data prior to 1998 were removed given the lack of release length information. While the additional data might provide further information to the model, which might be particularly useful when assuming the alternative regional structure, the approach used to estimate release length may introduce bias. A suggestion was to include tagging data with release lengths estimated using the random draw approach suggested above as a sensitivity run, although it was noted that dividing out the effect of model structure and release length data assumptions to ascertain what influenced model estimates would be challenging. This was discussed further under the potential axes of uncertainty for the skipjack assessment.

Matthew Vincent presented a summary of the approach used to develop the tagging data set to be used within the 2019 stock assessment. Challenges with the existing Japanese tagging data set were noted, which would be discussed after the workshop.

The workshop noted that the estimated release length information would inform estimated values such as age-specific fishing mortality, but were not used to estimate growth within MULTIFAN-CL.

The workshop suggested:

- **To use a random sample from the measured size distribution to fill in instances that had no available release length information for the Japanese tagging data, and compare the resulting**

lengths to the mean size currently estimated. Japanese scientists will attempt to do this for the 2019 assessment.

CPUE indices

Junji Kinoshita (NRIFSF, Japan) presented approaches used and results of the standardisation of Japanese pole and line CPUE data for the two alternative regional structures. The 'conventional' delta-GLM approach was used to develop these indices. It was noted that in some cases an index could not be derived for some of the alternative spatial model regions due to over-dispersion in the binomial component of the model.

The workshop discussed the use of a filter to remove trips of less than 5 days duration from the data set. The workshop noted that while previous reports to SC did not mention this filtering, this methodology was consistent with previous analyses. The reasoning for this filter was that these trips were felt to be near to the port and hence not representative of key fishing grounds. However, the offshore fleet generally performed short trips, and this approach filtered out considerable data. The candidate alternative regional structure might require this filter to be ignored.

Nicholas Ducharme-Barth presented the results of a geo-statistical analysis of Japanese pole and line data for the two alternative regional structures. Analyses were run for offshore and distant water fleets separately and combined, with the latter providing a wider spatial coverage. The analysis noted that vessel ID may not be unique, and further work was required on this. The suggestion was also made to retain those trips with less than 75% skipjack in the total catch within the data to be standardised.

The workshop noted that the inclusion of vessel ID was the most influential variable within the model, compared to other gear effects. SPC highlighted that in a declining fleet, more profitable/better performing vessels might remain in the fishery and hence influence CPUE. The influence of changing crew on vessel performance was also noted by the workshop, although this could not be included within the model.

Discussions on combining data from the distant water and offshore fleets for standardisation highlighted that the two fleets have very different fishing strategies. A key difference was the number of poles being used, which is included within the standardisation model. Albacore summer fishing by the distant water fleet is influenced by the location of fishing rather than the fishing approach, and hence could be accounted for within a standardisation model. The absolute values of CPUE between the two fleets was comparable in similar time/space regions. Based upon those discussions, the workshop agreed that combining the data were therefore appropriate, and that events where the total catch was <75% skipjack should also be included within the standardisation, given that fleets were not fishing differently in this case. The workshop also suggested plotting the vessel effect for the combined OS and DW fleet models.

As noted above, the potential to use the CPUE data to inform the model of relative abundance between regions was discussed. This could be investigated further given challenges with initial fits to the alternative spatial structure model.

Keith Bigelow (NMFS, USA) presented the standardised CPUE index for region 4 of the assessment model for skipjack from the domestic purse seine fishery (PH-4 and S-ID). The model with yr/qtr + vessel effects was preferred, given uncertainty in recorded geographic area. The workshop agreed with this approach.

The workshop suggested:

- **That the geostatistical analysis of the Japanese pole and line data use information from both the OS and DW fleets within the same model (including fleet as a covariate) for Region 1, and that those trips where catches of skipjack are less than 75% of the catch be included.**
- **Plotting the vessel effect for the combined OS and DW fleet models, as performed for the single-fleet models.**
- **That Japanese scientists investigate the effect of removing the filter removing trips of less than 5 days within the 'conventional' CPUE standardisation of Japanese pole and line data.**
- **Investigating the relative CPUE between regions to inform model regional scaling where the alternative regional structure is considered.**
- **For the region 4 (ID/PH) CPUE standardisation, given the uncertainty in area declared, the model including year/qtr and vessel was recommended.**

Preparation of size data

Matthew Vincent presented the size data available for the 2019 skipjack assessment. The approach used by Abascal et al. (2014) would be repeated for the length composition data. Samples were spatially weighted by catch at the set and spatial strata level, with thresholds applied to ensure small samples from important catch strata did not receive too much weight within the model. For Region 4, issues with the different flags operating within this region were discussed. It was noted that Japanese vessels are quite a different operation to that of the Indonesian fishery, who likely concentrate on anchored FADs, and the resulting catch size structures were notably different. The potential to share the selectivity of longline gear within the model was also discussed.

The workshop agreed that the approach of Abascal et al. be used, with a review of the code to ensure all appropriate purse seine samples (beyond Pago Pago samples) are appropriately included and that port/observer data are not being double-counted.

The workshop noted that transitions in the Japanese pole and line length frequency data in Region 1 occurred in the late 1980s. This would be an area of subsequent investigation.

The workshop suggested:

- **That the approach of Abascal et al. be used in the preparation of the size data, with a review of the code to ensure all appropriate samples (beyond Pago Pago samples) are included and that port/observer data are not double-counted.**
- **That longline selectivity be combined across regions.**

- **With regard to sharing selectivity between ID/PH/VN in Region 4, confirm whether any changes in data had occurred over the recent period, but otherwise maintain the approach used in the 2016 assessment.**
- **For the Region 4 pole and line data, include only the Indonesian data within the model.**

Model structure and key sensitivities

Matthew Vincent summarised the planned stepwise developments to the 2019 diagnostic case model approach from the 2016 model, and a consideration of key model runs and areas of uncertainty that might be examined in the 2019 assessment. SPC's plan was to provide the results for the skipjack assessment across the uncertainty grid, as done in recent years for other stocks, from which SC could then select and weight axes of uncertainty as desired. The range of proposed one-off sensitivities were listed that would inform the uncertainty grid, and the initial proposed uncertainty grid, were discussed.

The tentative grid covered: SRR steepness (3 levels), tag mixing (2 periods), size data weighting (3 levels, unless the self-scaling multinomial function within MULTIFAN-CL was felt sufficiently robust for this assessment), CPUE inputs for model regions 1, 2 and 3 (2 series, the 'conventional' approach and geostatistics combining distant water and offshore fleets), and tag data adjustment (2 data sets, with and without Japanese tagging data requiring the estimation of release lengths).

It was noted that tag overdispersion, which was in the 2016 grid, would now be estimated internally within the MULTIFAN-CL model. This meant 72 models including the size data weighting axis, or 24 models without size data weighting. SPC noted that this tentative grid was subject to exploration.

The workshop:

- **Agreed to the suggested tentative model uncertainty grid indicated above.**

Southwest Pacific striped marlin assessment

Recent ageing of striped marlin

Jessica Farley (CSIRO, AU) presented the results of a preliminary study ageing SW Pacific striped marlin using both otoliths and fin spines. Otolith ages tended to provide older age estimates than those derived from spines. Newer sectioning techniques appeared to improve readability of otoliths compared to previous studies. Estimates of length-at-age generally corresponded to existing growth curves, but did imply older longevities than previously estimated. However, ages were not yet validated. Bomb radiocarbon could be used as an approach for validation.

It was noted that the previous SW Pacific assessment used a 10+ year group, while ISC is assuming a maximum age of 15 yrs for the North Pacific striped marlin assessment currently underway. The 10 year plus-group was to be maintained in the 2019 SW Pacific striped marlin assessment.

The workshop:

- **agreed that the 10+ group be maintained in the 2019 assessment.**

Proposed approach for the SW Pacific striped marlin assessment

Nicholas Ducharme-Barth summarised the approach used in and findings of the 2012 SW Pacific striped marlin assessment, and presented the proposed approach for the 2019 assessment. The current proposed model period is 1952 to 2017. The high catch in 1953 in fleet Region 2 in the Japanese distant water fleet was noted and the basis of this catch would be checked. This could have implications for the year used as the first year in the model time period. The potential for misreporting of data at the species level was discussed, but the workshop considered this to be primarily an issue between blue and black marlin.

During development of the NP striped marlin assessment, a high catch of striped marlin in the driftnet fishery was estimated. A theory was that the southern driftnet catch may have been mis-assigned to the northern region, but there was no indication of the potential level of catch that may have been transferred. The workshop noted that the South Pacific albacore assessment included driftnet catch from the late 1980s to early 1990s only, which is shorter than the year range for the North Pacific. The single available observer trip from the driftnet fishery in the southern WCPO, around the southern Tasman Sea, recorded 18 striped marlin compared to around 16,000 albacore. This suggested that catches in the southern driftnet fishery may have been low by comparison to the north, and the workshop agreed catches from this fishery should not be included in the 2019 SW Pacific assessment.

Discard mortality was assumed to be 100% for the model, but it was noted that in the northern Australia area discard mortality was not considered to be that high. New Zealand discard reporting rates may have changed following the implementation of new regulations. Discard mortality as a result of tagging activities could be assumed to result in an additional 20% 'catch'.

The workshop discussed the approach for continuing the time series for the Australian recreational fishery, whose catch data ended in 2012. The assumption could be made that a recent average effort level be continued in the subsequent years, so that catch can be estimated within the model based on underlying abundance.

The workshop suggested:

- **Examining catch estimates for the early years of the model, and on the basis of that evaluation consider whether the starting year of the model needed adjustment (e.g. 1952 or 1955).**
- **Ignoring potential catch of striped marlin in South Pacific driftnet fisheries given the likely low level of catch within this fishery.**
- **Assume Australian recreational fishery effort has continued since 2012 at recent average levels.**

Biological and structural assumptions for the SW Pacific striped marlin assessment

Nicholas Ducharme-Barth presented the potential biological parameters to be used within the 2019 SW Pacific striped marlin assessment. The potential to develop a sex-disaggregated model, as a one-off sensitivity model, was noted, given some sexual dimorphism in the growth of this species (if less sexual dimorphism than seen for species such as swordfish). Data on the sex ratio at length would also be examined for maturity parameterisation.

The workshop noted that the uncertainty in key biological parameters was equally large for both North and SW Pacific striped marlin assessments. Differences in the size distribution in the north Pacific (generally smaller fish) were noted, which might suggest different growth patterns in the two regions, reducing the transferability of biological parameter assumptions between regions.

Within the SW Pacific striped marlin assessment, growth was proposed as an axis of uncertainty. The workshop agreed with this approach. The options on the axis would be considered during model development, but the initial plan was to include a fixed growth curve, a growth curve estimated within the model, and a further scenario that was to be developed.

Use of the maturity-at-length estimates available from Kopf et al. was proposed, and would be cross-checked against values used within the North Pacific assessment.

For natural mortality, the approach used in the north Pacific in 2011 assumed a slightly higher M at age at the youngest ages. It was agreed that this assumption also be used for the SW Pacific assessment (rather than the constant M at age used in the 2012 SW Pacific assessment), with alternative adult M levels of 0.4, and 25% above and below that level, using the same M-at-age form.

The spatial structure of the model was discussed. The 2012 assessment assumed one model region, with that region broken down to allow different fleet structures to be considered. The issue of developing a more detailed spatial structure divided into two model regions at 165°E, with potentially 7 fleet regions was discussed. Information to inform that potential spatial structure from tags was presented, with Australian tags showing limited movement within the western region, and New Zealand tags showing considerable movement across the current model region. The proposed approach for the 2019 assessment was to use the 2012 regional structure as the primary model structure. Consideration would then be given to a potential stepwise one-off sensitivity examining first: the alternative fleet structure (e.g. 7 fleet regions) within that single region model; and second: the alternative spatial structure (divided at 165°E) consistent with those 7 fleet regions, with two regional abundance indices (as well as regional weights and consideration of regional recruitment levels), with alternative assumptions on diffusion between the two regions.

<u>The workshop suggested:</u>

- **The proposed approach of using the 2012 single region structure as the primary model was appropriate. It was agreed that a stepwise one-off sensitivity analysis would be examined if feasible within the time available with 1) seven fleet groups but the 2012 spatial structure, and then 2) the alternative spatial structure (divided at 165°E) consistent with those seven**

fleet groups, with three alternative diffusion assumptions of zero, 10 and 40%, unless alternative values were made available.

- **The proposed approach of using an M-at-age form comparable to that of the North Pacific assessment, with higher mortality at younger ages and alternative adult M levels of 0.4, and 25% above and below that level, using the same M-at-age form, was appropriate.**

CPUE time series

John Holdsworth (Blue Water Marine Research Ltd, NZ) described the preparation of the New Zealand recreational longline CPUE time series, and tagging data.

The workshop noted that the targeting effect included within the model was based upon self-reported species targeting during a trip. The level of change in the skipper/crew on a vessel over time was of interest, given the notable vessel effect within the model. Some key vessels were felt to have had reasonable consistency in skippers. Communications between recreational vessels were also important when searching for striped marlin, as well as prior knowledge of good fishing locations. It was noted that effort was modelled as a polynomial rather than an offset, which might cause issues where effort is high. This approach had commonly been used across a range of CPUE analyses in New Zealand, although the basis for the approach was not known.

Rob Campbell (CSIRO, Australia) described the preparation of different Australian CPUE time series, with data from recreational fishing clubs (landed fish) and from game-fishing tagging information (estimated weights/lengths). Changes in reporting from the recreational club was noted. Updates to the standardised indices from tournament data are being considered, but has not yet been performed. Further work has been undertaken examining the recreational fishery data in more detail. Models have incorporated environmental variables and the potential influence of industrial fisheries (fishing level, discards) on recreational catch rates. An index of this type could be used as an alternative Australian recreational fishery index within the 2019 assessment. Finally, abundance indices from the Australian industrial longline fishery were described, starting in 1998. Indices from the different Australian fisheries were not consistent, and it was suggested that the Australian longline CPUE index was probably most representative of abundance off the east coast of Australia.

The workshop noted that in the previous assessment, a commercial Australian longline index was provided in fleet regions 2 and 3 of the model. It was confirmed that this could be repeated as needed. The workshop discussed whether a recreational index should be included, given the opinion that the longline index would likely be more indicative of abundance. The tournament index was preferred as the source of a recreational fishery index, given the additional information that is collected and which can be used within the standardisation.

Nicholas Ducharme-Barth presented the regional CPUE series based upon the Japanese and Chinese Taipei longline fleets to inform the 2019 stock assessment. Different levels of information were available during the time series. Three abundance indices were presented, being: one based upon the approach used in the previous assessment (on aggregate data); one based upon a delta-GLM (with log(number/hook)); and one from the geostatistical modelling approach. Aggregate data allowed a

longer abundance time series to be developed, and the use of these data was preferred given the similarity of the indices between operational and aggregate data where those time series overlapped. However, assumptions needed to be made early in the time series prior to the operational data being available, and these assumptions needed to be examined (see below). The billfish species proportions in the catch over time should also be evaluated. Chinese Taipei scientists noted that they had also performed a standardisation based upon their data, and gained consistent results to those presented.

In the early 1950s, the longline CPUE time series showed notable reductions, which corresponded with high catch rates off eastern Australia. The workshop discussed whether those early years should be included within the model, given uncertainty on whether the decline mirrored actual reductions in abundance and that catch levels were not consistently higher than later in the time period. Logbooks for key fleets have also changed over time, which contributed to the fact that these early years of billfish catch data require some catch reconstruction, which should be checked further. It was noted that the MULTIFAN-CL model can adjust catchability in an attempt to reconcile CPUE and catch trends where the CV on the CPUE estimates is sufficiently large. In the 2012 assessment, the Japanese region 2 fleet was assumed to have constant catchability (as the fleet that received the standardised index), and estimated effort devs showed some more positive values in that period. Knot distribution (uniform or preferential knot placement, finer mesh) within the geostats model led to different levels of initial standardised index decline, which required further diagnosis (e.g. plotting the omega v epsilon values to see whether there was a significant relationship). The workshop also suggested removing the early years to see whether there was an impact on the spatial distribution/abundance surface.

The use of a single index of each gear type was recommended to avoid conflicts. Comparability between indices would be examined prior to inclusion in the model.

The workshop suggested:

- **Utilising the geostats CPUE for the diagnostic case model for JP & TW data combined in fleet regions 1-4, and considering the consistency of other CPUE time series to that index before their inclusion in the model.**
- **Given the potential uncertainty with the catch levels in the very early years, removing those years from the geostats model to see whether there was an impact on the spatial distribution/abundance surface.**

Proposed approach to the 2019 assessment

Nicholas Ducharme-Barth presented the proposed approach for the diagnostic case model and potential key sensitivities for the 2019 assessment. The proposed approach included the presentation of stock status results against both the Kobe (MSY) and Majuro (depletion) metrics.

The tentative uncertainty grid was discussed, being: M (3 levels, as described above), growth (3 levels, fixed, estimated and another scenario to be developed), steepness (3 levels), data weighting (2 levels but potentially the self-scaling multinomial could be used). Other axes would be considered based upon the one-off sensitivity analyses.

The workshop suggested:

- **Agreed with the preliminary uncertainty grid structure as detailed.**

Bigeye and yellowfin growth

Graham Pilling summarised the 2019 IATTC/WCPFC workshop on bigeye and yellowfin growth, held in La Jolla, California, in January. The workshop noted the importance of getting otoliths back from tag returns, particularly those at liberty for a long time (and from archival tags) given the potential to identify a growth check in the otolith which could allow those otoliths to be used for additional validation of ageing. It was also noted that the MULTIFAN-CL model assumes a multinomial distribution of ages for each length class. Where models have a quarterly time step, the process of assigning a birthday to calculate decimal ages means that the data supplied to MULTIFAN-CL does not correspond to the multinomial assumption. The use of adjusted counts for cohorts, aggregated to annual ages, would be more appropriate. The PAW noted the discussions of the IATTC/WCPFC workshop on bigeye, and the suggested inclusion of high quality tag information within the estimation of growth of tuna species.

Jessica Farley presented a background to tuna ageing approaches in the WCPO and the subsequent work performed on bigeye and yellowfin age and growth (WCPFC Projects 94 and 82). Preliminary ageing of SrCl marked WCPO bigeye otoliths suggested under-estimates of daily ages based upon initial readings by IATTC scientists. Those readings will be repeated and re-assessed in June. WCPO daily increments read using electron microscopy also underestimated days at liberty. Preliminary results for yellowfin were also presented. Daily rings in yellowfin appeared more difficult to count, even under SEM, and did not appear to be a valid approach for WCPO otoliths.

Preliminary results from a spatial examination of otolith weight were also shown. The use of otolith weight suggested that some variability in the shape of the otolith might occur between the EPO and WCPO. Use of otolith weight for yellowfin might help to inform age estimates.

The data available so far does suggest real differences in bigeye growth between the WCPO and EPO, and daily ageing does seem to be prone to underestimate the age of WCPO fish (but appears appropriate for EPO fish given successful validation up to 118cm with reasonable numbers of fish). The clarity of daily rings does vary between individuals, with considerable splits occurring. Sectioning along the longest plane of the otolith for the reading of daily rings was consistent between the WCPO and EPO, given that daily ages along the transverse section had been found to further underestimate age in WCPO otoliths.

The workshop noted the importance of expanding validation in both space and across the fish size/age range.

For yellowfin (Project 82), ageing larger WCPO fish through daily rings appears inappropriate given the results above. With the project objectives to construct a WCPFC-wide sex aggregated growth curve, and

subsequently to examine sex and regional effects, a random sample stratified by region and size (proportional to biomass) was suggested. The use of the annual ageing approach was agreed.

The workshop suggested:

- **That a random sampling approach stratified by region and size be used to select yellowfin otolith samples from the tissue bank.**
- **The use of annual ageing was agreed for WCPO yellowfin.**

Oceanic whitetip shark stock assessment

Overview, biological assumptions, spatial structure and fisheries

Laura Tremblay-Boyer (Dragonfly Data Science, New Zealand) presented an overview of the previous WCPO oceanic whitetip shark assessment and the proposed approach for the 2019 assessment, using stock synthesis. Updates will include revisiting biological assumptions (maximum age, K) and moving toward a single sex assessment, retaining the regional structure and fleets, and reviewing the CPUE standardisation approaches.

Growth and natural mortality parameters were areas of uncertainty to be considered within the assessment, with more recent estimates of growth rate implying faster growth than those estimated historically. The natural mortality grid used in the 2012 assessment was proposed to be used in the 2019 assessment.

The 2012 spatial structure would be maintained for the 2019 assessment, along with the resulting fisheries (target and bycatch longline, associated and unassociated purse seine).

The workshop asked whether there were genetic studies to help define spatial structure. The latest studies suggested a potential Indo-Pacific distribution, but did not add information for the WCPO assessment.

Preparation of catch and CPUE time series

Laura Tremblay-Boyer presented the proposed approach to developing catch and CPUE time series for input into the 2019 assessment. This was identified as another key area of uncertainty, in particular since recent shark CMMs would have an influence on recent catch and discarding levels.

Catch reconstruction was proposed through two general approaches, the first being comparable to Tremblay-Boyer et al. (2016) and Peatman et al. (2018) and developed within a Bayesian framework, and the second being based upon trade estimates. An advantage for oceanic whitetip shark of the latter approach was the easy identification of the fins for this species. These two general approaches would lead to a range of catch time series scenarios.

The workshop noted that an environmental variable would be considered within the catch reconstruction approach, but discussed whether the inclusion of latitude/longitude would also be

effective. Given that SST is known to influence catches, was relatively easy to model and could capture the seasonality patterns identified by Langley in 2018, the use of this variable was felt appropriate.

In addition, while Hawaii-based observer data were predominant in the early years, that fleet had moved operations northeast in recent years, potentially moving out of oceanic whitetip shark habitat. This could lead to a declining CPUE trend that was not representative of abundance. The workshop noted that an SST covariate might be useful to take this into account.

CPUE standardisation work would concentrate on target and bycatch longline fleets. The use of purse seine data for standardisation was felt to be of lower priority. A similar approach to that developed for the 2015 indicator analysis would be used for the longline fleets, allowing for different dispersion for target and non-target fisheries, as well as seasonal trends. In addition, potential shifts of observer distribution, e.g. in the Hawaii-based observer data, would be accounted for via a spatial cell effect or alternatively environmental covariates representative of the oceanic whitetip shark's habitat.

The workshop discussed which indices might best relate to abundance for the WCPO. The historical target longline fishery was very localised around PNG, and had been variable. Purse seine indices would be localised in the tropics, noting that purse seine effort is hard to characterise, and as scientific observers are increasingly busy on vessels, a reduction in bycatch observations may reflect the increasing range of information the observer is required to collect, rather than actual reductions in incidence. The longline bycatch index would likely be the most important for the assessment, but the CMM in place may lead to a degradation of the catch quality in the recent time period. The workshop noted that the amount of observer reports on shark fate in the most recent years was lower than historically, which may result from recent data still being processed. The availability of recent data may influence the last year to be included within the model.

The potential for longline shark interactions to be missed by the observer due to branch lines being cut was discussed. This consideration was based on anecdotal evidence. The workshop asked whether branch line cutting events were recorded on observer forms, as this would help develop a level of potential catch and in particular CPUE standardisation. Potential levels of mortality in discarded shark would need to be taken into account. The pragmatic approach would be to apply the same post-release mortality level across all discard events, but it was acknowledged that line cutting might lead to higher mortality through subsequent entanglement with the line. These issues would be investigated further, by examining observer records for 'generic shark' and records of lines being cut. The workshop noted that bycatch modelling performed in 2018 did not indicate any reduction in catch of the species in recent years. Levels of interaction in the years just prior to CMM implementation could be assumed to continue into the future, as a potential scenario.

Proposed approach for the diagnostic case model and key sensitivities

Laura Tremblay-Boyer presented the proposed approach for the diagnostic case model, and key sensitivities. The preliminary grid included: catch scenarios (catch rate projected on effort and trade based, with lower and upper bounds for each), CPUE (observer logsheet for target and bycatch fleets, incorporating branchline cutting scenarios), initial level of fishing mortality (3 values from the previous

assessment), SRR steepness (3 values), growth parameter K (2 values), and recruitment deviation (if sensitive).

The workshop noted that size composition data for sharks may have significant issues, so instead of having sample size weighting in the grid, this could be used within SS to better drive the fit to the CPUE indices. This would reduce the size of the grid.

Initial fishing mortality and sigma R were agreed by the workshop as likely to be very important. The workshop discussed that the model could be run with initial F levels at a range of fixed values to see how sensitive the model is to the assumption, with the potential to then free up the value to see how well the model performs.

In the previous assessment, expert weighting was used to inform management advice. The same approach was proposed for the 2019 assessment, with the weighting developed through discussion with interested workshop attendees via electronic means prior to submission of the paper to SC. The median values for stock status could be bootstrapped relative to the weighting applied to each axis.

The use of MSY-based reference points was proposed as the basis for management advice, given the absence of guidance on other benchmarks by the Commission. The workshop also suggested that if time allowed, use of alternative reference points, e.g. depletion of spawning biomass, would be welcomed.

The workshop suggested:

- **The tentative uncertainty grid was appropriate.**
- **That sample size weighting be used to better drive the fit to the CPUE indices, thereby reducing the size of the grid.**
- **That the approach of weighting the grid of runs through expert opinion from workshop attendees, through electronic means, be used.**
- **That the use of MSY reference points was appropriate as the basis for management advice. The workshop also noted that if time allowed, use of some of the alternative reference points presented in 2018 would be welcomed.**

Harvest strategy and technical developments in WCPO MSE

Robert Scott (OFP, SPC) presented an overview of the work performed up to 2019 on WCPFC harvest strategies and in particular the outputs and requests from SC14.

South Pacific albacore CPUE analyses

Nan Yao (OFP, SPC) presented the analyses to date on SP albacore CPUE to inform the development of a harvest strategy for this stock.

There was a discussion on the clustering analysis and the extended time frame of data considered for the clustering. It was noted that if the clustering was performed in smaller time blocks the resulting

clusters may be more appropriate due to the change of gears and possibly species proportions in the fishery.

The likely impact of the troll fisheries and their utility in providing a CPUE index for SP albacore was discussed. Analyses in New Zealand have indicated that their troll fishery is not considered suitable as a CPUE index as it is heavily influenced by environmental conditions and is more likely to be an index of availability of juvenile fish in New Zealand waters. It was further noted that catches by the troll fisheries represent only a small proportion of total catches (around 3%). The USA troll data was also not considered informative as it consists of only 6% of the overall troll catch.

The effects of hyperstability on CPUE was discussed, but was considered to be difficult to detect in the Pacific longline fishery. Hyperstability could be taken into account within the OM grid. The impact of using different fleets or groups of fleets was discussed and could be investigated through the HCR settings (note the recommendations). SPC should decide which fishery(ies) to include in the CPUE analyses before deciding how to use CPUE to drive harvest control rule. The PICT fleet might provide better information on the gear characteristics used, as it is more challenging to get these information from DWFN fleets, particularly from the aggregated data.

The workshop suggested:

- **Using blocks of time for the cluster analysis when exploring targeting practices in the fisheries.**
- **That time lags should be considered when standardising CPUE and in OM conditioning.**
- **That as the New Zealand troll index was not considered an index of abundance but rather an index of availability of fish in New Zealand, New Zealand troll data should not be used in the HCR development.**
- **Evaluating trends in specific fleets (TW, CN, JP) and examine the variance of CPUE indices when considering which CPUE series to use within analyses.**
- **Information available from PICT fleets might better capture details on gear characteristics, which is often harder to identify for DWFN fleets (with aggregate data).**
- **That in order to assess the use of different fleets in the HCR development, the same HCR should be run with different input CPUE data (e.g. HCR1 with PICT; HCR 1 DWFN; HCR 1 combined PIC and DWFN; HCR1 single DW fleet only).**
- **Considering selection effects and hyperstability when relating CPUE trends to biomass dynamics and specifically the TRP.**

South Pacific albacore uncertainties and Operating Model conditioning

Nan Yao presented the key uncertainties being considered within the SP albacore MSE modelling framework, and the approach to conditioning appropriate OMs for the work.

The potential impact of climate change was discussed, and the potential use of SEAPODYM to predict changes in biomass distribution with climate change was raised. It was noted that SEAPODYM predictions for albacore were particularly sensitive to the model assumptions, and hence there is increased uncertainty in outputs for this species.

The PAW noted that while the assessment is run in quarterly time steps, it would be good to present annual trends in addition to the quarterly ones as these are easier to interpret visually.

The workshop suggested:

- **Using the grid from the assessment for conditioning the OM, as well as including hyperstability options in the OM grid.**

Thoughts on modelling multi-species multi-fleet issues

Finlay Scott (OFP, SPC) presented current thoughts on potential approaches to evaluating multispecies/multifleet interactions within WCPO MSE modelling. The PAW noted that one method to combine the bigeye and yellowfin yield data could be to group them together as a maximum yield curve. It was noted that other multispecies/multifleet models are used in some fisheries in Australia and the Baltic Sea but these are usually for small fisheries.

Skipjack modelling framework updates

Robert Scott summarised the latest status of the MSE modelling framework for the WCPO skipjack stock/purse seine fishery. A key issue was the estimation model to be used within the framework, as well as the generation of pseudo-data.

The workshop enquired what would happen if the MULTIFAN-CL model could not converge within the MSE modelling process. An automatic checking process is planned to ensure that models did not move into unrealistic population spaces. Potentially, an MSE run that suffered from this would then be excluded from the results.

Presenting MSE results to managers

Finlay Scott presented his Shiny tool to the meeting, which summarised the current ideas on approaches to present MSE modelling results to managers and stakeholders, using WCPO skipjack as an example.

The workshop thought that the approach was useful for scientists, managers and wider stakeholders. Guidance on how to interpret the results would be also be welcomed. The workshop also enquired about the performance indicators that were presented at SC14 that could not at the time be calculated, and were informed that further development was ongoing.

The workshop:

- **Supported further development of the MSE results presentation tool.**

Overview of activities in the WCPFC 2019 harvest strategy work plan and actions for SC15

Graham Pilling summarised the work to be undertaken in 2019 as described in the WCPFC harvest strategy work plan, and specific actions for SC15. The requirement to re-evaluate the skipjack TRP in 2019 was noted, which would need to be performed after the new skipjack assessment had been agreed by SC15. Guidance would be sought from SC15 on how this evaluation should be performed. The workshop noted that the previous analysis of the consequences of a TRP set at 40, 50 and 60% $SB_{F=0}$ could be repeated.

The current status of the science-management dialogue (SMD) was discussed. The workshop suggested that no further work on the TOR for that potential meeting was required, and the paper delivered to WCPFC15 could be provided to SC15 as an information paper for noting and a discussion on the SMD be held during the Management Issues theme.

With regards estimation of TRPs for bigeye and yellowfin, the workshop noted that learning from the work underpinning the TRPs for skipjack and South Pacific albacore could be applied.

The workshop:

- **Suggested that the paper delivered to WCPFC15 on the terms of reference for the science-manager dialogue (SMD) meeting be re-submitted to SC15 as an information paper, and the SMD discussed during the Management Information theme session.**

Trajectories of SPA to the adopted interim TRP

Graham Pilling summarised planned work evaluating alternative pathways to the adopted South Pacific albacore TRP as requested by WCPFC15, to be presented to SC15. Stochastic projections under three different scenarios to bracket potential options were planned. These included the (unrealistic) scenario of ceasing all fishing (which would indicate the fastest time the TRP could be achieved within biological constraints), a year-on-year % reduction in catch that achieved the TRP in 20 years (the maximum time period indicated by WCPFC15) and a scenario that lay between those two options. The workshop agreed with this approach.

Developments in the MULTIFAN-CL software

Nick Davies of Te Takina Ltd. presented developments in the latest release of the MULTIFAN-CL software (version 2.0.5.1), focusing on those areas of particular relevance for the upcoming stock assessments, and the work plan for MULTIFAN-CL development over the coming year.

The workshop noted the similarity in growth between sexes of striped marlin, and enquired whether it would be beneficial to apply a sex-structured model. It was suggested that it was worthwhile investigating the use of this approach where appropriate, particularly if there were sex-ratio differences between regions of the model.

The workshop discussed the estimation of tagging pseudodata. It was noted that the multinomial probability of capture estimated within the assessment was used to generate predicted tags, with the application of a multinomial error in the pseudo-tagging estimation. This allowed the user to examine the approach of using – or not – tagging data within a management procedure. There is the potential to add in or adjust over-dispersion within the generation of pseudo-tagging data, but that approach needed to be developed.

Other activities

WCPO seabird bycatch analyses

Tom Peatman (OFP, SPC) presented the latest analyses estimating seabird bycatch within WCPO fisheries under Project 68. Results of the preliminary modelling were shown, and it was highlighted that further work would be undertaken prior to SC15.

The workshop noted that in particular regions, such as NZ, observers have different specific trips specifically recording bird interactions or fish sampling, etc. The importance of this issue should be considered when estimating observer coverage for the purpose of evaluating seabird bycatch.

The workshop noted that estimates for specific fleets (e.g. US, NZ, AU) from this study could be compared with separate estimates developed for those fleets. The workshop also noted challenges in identifying to the species level in particular cases, and the use of photo-guides was recommended.

The workshop suggested:

- **The specific nature of each of observer trip (observing seabird interactions, fish sampling, etc.) in New Zealand should be taken into account when estimating seabird bycatch coverage where necessary.**
- **That estimates for specific fleets (US, AU, NZ) be compared to separate estimates for those fleets.**

Japanese recent research activities

Hidetada Kiyofuji presented recent Japanese tagging research, focused on horizontal and vertical movement patterns, and research cruises focussing on larval and small tuna.

From the tagging information, the 18°C isotherm was an appropriate indicator for the lowest thermal limit of skipjack tuna distribution, which could prove a useful parameter within CPUE standardisation approaches.

New tagging research focuses on where skipjack smaller than 40cm arrive from, by tagging further south in the 5-15°N area. Just under 1,100 fish were tagged in the recent cruise, and larger fish tagged with archival tags. A further cruise in 2019 will focus upon larger fish in an attempt to identify where they migrate to. Archival tags would be deployed on fish of 40cm+.

Recent research cruises have performed larval surveys from Philippines to FSM, northward toward Japan. Tows evaluated the horizontal and vertical distribution of juvenile skipjack and stomach contents.

The workshop enquired about the tow speed (30m opening, 4 knot speed). The speed at which small fish can swim away from the net was noted along with the challenges of catching and sampling small tuna.

The workshop asked whether tag seeding and shedding studies were being considered. In the recent tagging cruise, tag seeding was performed on 10 individuals, but no returns had yet been received. The

reporting rate was noted to be lower in Japan due to the restrictions on providing cash rewards. Double tagging has also been performed. The potential to use the process to OTC mark fish for otolith validation was noted.

Final remarks

Steve Brouwer thanked participants for a fruitful workshop and indicated that a draft workshop report would be circulated for comment among meeting participants prior to finalisation and submission to SC15.

APPENDIX 1: List of Participants

Name	Affiliation
John Annala	Ministry for Primary Industries, New Zealand
John Holdsworth	Blue Water Marine Research Ltd, New Zealand
Rob Campbell	CSIRO, Australia
Jessica Farley	CSIRO, Australia
Sangaa Clark	PNAO
Berry Muller	MIMRA, RMI
Wetjins Dimlich	FFA Secretariat
Keith Bigelow	NOAA, USA
Felipe Carvalho	NOAA, USA
Eric Chang	National Sun Yat-sen University, Chinese Taipei
Yi-Jay Chang	National Sun Yat-sen University, Chinese Taipei
Hung-I Liu	Overseas Fisheries Development Council, Chinese Taipei
Keisuke Satoh	National Research Institute of Far Seas Fisheries, Japan
Hidetada Kiyofuji	National Research Institute of Far Seas Fisheries, Japan
Yoshinori Aoki	National Research Institute of Far Seas Fisheries, Japan
Junji Kinoshita	National Research Institute of Far Seas Fisheries, Japan
Francisco Abascal Crespo	IEO, Spain
Sung Il Lee	National Institute of Fisheries Science, Korea
Doon Nam Kim	National Institute of Fisheries Science, Korea
Ueta Faasili Jnr	Ministry of Agriculture and Fisheries, Samoa
Laura Tremblay-Boyer	Dragonfly Data Science, New Zealand
SungKwon Soh	WCPFC Secretariat
John Hampton	SPC
Graham Pilling	SPC
Steve Brouwer	SPC
Matthew Vincent	SPC
Nicholas Ducharme-Barth	SPC
Rob Scott	SPC
Finlay Scott	SPC
Nan Yao	SPC
Peter Williams	SPC
Tom Peatman	SPC
Nick Davies	SPC Consultant

APPENDIX 2: Terms of Reference

The Oceanic Fisheries Programme (OFP) of SPC is contracted by WCPFC to undertake stock assessments. The results of these assessments will be presented at the WCPFC Scientific Committee. In preparation for these assessments, OFP is hosting a pre-assessment workshop to discuss key issues related to the assessments. The terms of reference for this workshop are provided below.

Terms of Reference

- Review the most recent completed assessments, in particular, any concerns, suggestions and/or recommendations raised by the Scientific Committee, the Commission, research providers, individual CCMs, or any independent reviews;
- Review preliminary work undertaken by the service provider relating to the stock assessments, including any proposed:
    - revisions to biological parameters
    - revisions to historical data
    - changes to structural assumptions in the model
    - methodological issues, e.g. characterization of uncertainty
    - standardized CPUE analysis
    - incorporation of tagging data or other auxiliary data
- Provides guidance to the OFP on:
    - the suitability of any proposed changes and any suggested additional work
    - a minimum set model runs to be undertaken, in particular the range of key sensitivity analyses
    - desired model diagnostics to be presented
    - alternative modeling approaches that could be considered

The outcomes of the meeting will be documented in two ways, a report of the meeting and in the assessment working papers themselves. The report of the meeting will be distributed to workshop participants for comment within 10 working days of the meeting and revised and provided to WCPFC Scientific Committee members 30 days after the meeting. It will also be submitted to the next Scientific Committee as a Working Paper. Many of the matters discussed to the workshop will be the subject of meeting papers to the Scientific Committee.

Due to the timing of the meeting, any model runs presented will be based on previous assessment data sets, and therefore no preliminary stock assessment runs will be undertaken. Further, the workshop will occur prior to the submission of data and completion of supporting analyses (e.g. CPUE analyses). Therefore, any major changes to historical data submitted by CMM's, or new data could result in a need to consider alternative model runs or structures not considered previously. In such instances, supporting documentation will be provided to the SC via working papers to allow the SC to determine the merits of any proposed changes.

The consultation will be open to participation by all CCMs and to other experts, by invitation. CCMs will be expected to fund their participation although SIDS and participating territories may seek support from the Commission's Special Requirements Fund or other sources, as appropriate.