Western and Central Pacific Fisheries Commission

SCIENTIFIC COMMITTEE

SEVENTH REGULAR SESSION

7-15 August 2012

Busan, Republic of Korea

SPC-OFP response to the independent review of the 2011 bigeye tuna assessment

WCPFC-SC8-2012/IP-02

SPC-OFP

Secretariat of the Pacific Community, Noumea, New Caledonia

SPC-OFP response to the independent review of the 2011 bigeye tuna assessment

Secretariat of the Pacific Community - Oceanic Fisheries Programme

This is the second formal independent review undertaken of a stock assessment conducted by SPC-OFP in the past two years. The earlier review was a desk review coordinated by the Center for Independent Experts based at the University of Miami. The current review was an on-site panel review that involved extensive interaction between assessment staff and the review team. In our view, this was a much better review process, and has provided sound advice for the further development of the bigeye and other assessments.

SPC-OFP essentially agrees with all review recommendations. Our detailed responses are summarized in the table below. Many of the recommendations have implications for the SC and WCPFC in terms of resourcing and prioritization and work and we have highlighted these in the table. The recommendations also have significant implications for work in support of the actual assessments themselves, particularly in the areas of data exploration and analysis, and model development. We also note that the recommendations, while made in respect of the bigeye assessment, will have wider application to yellowfin and skipjack assessments in particular.

We thank the reviewers for their hard work and professionalism in the conduct of this review. It was a challenging but rewarding experience for SPC-OFP, and we believe the implementation of the review recommendations will greatly improve our assessments over the coming years. We look forward to further reviews of this nature in the future.

Key review recommendations and SPC-OFP responses

Review recommendation	SPC-OFP response	Implications for SC to consider
1) When moving from one reference model to a modified one, care should be taken to change only one factor at a time to ensure the impact of changes can be fully understood.	Agree.	
2) The way the fisheries are linked should be more fully documented in the assessment report, and the implications of such linkage should be more fully evaluated.	Agree and will include a table like Table E1 in future assessment reports.	
3) A Pacific-wide assessment should be conducted soon to evaluate whether the past conclusion that the results from a WCPO-only assessment are consistent with expectations from a Pacific-wide assessment remains true.	Agree	This represents another stock assessment and therefore needs to be prioritized with other assessment requests. It will require collaboration and travel resources to work with the IATTC.
4) Pacific-wide assessments should be conducted regularly (~ every five years) to confirm the assumption that a WCPO-only assessment will provide robust estimates of stock status.	Agree	See above
5) Continue tagging programs to allow estimates of movement rates to be obtained for a wide range of environmental conditions	Agree, and emphasise that this is also of importance to yellowfin and skipjack tuna which are predominantly taken in surface fisheries. It has been shown that assessments using integrated statistical models for WCPO skipjack in particular are at best unreliable and at worst impossible without good quality and high volume tagging data.	This will have considerable budgetary implications. The costs (including tag recovery, database and analytical support) of an annual three month pole-and-line based tagging cruise in the western WCPO and an annual 4-6 week tagging cruise in the central Pacific Ocean (targeting BET) are around USD1.5 million.
6) High volume small-fish fisheries (e.g., Philippines and Indonesia) should be retained in the model to ensure their catches are removed from the population correctly with respect to length. However, the	Agree, although we note that data from these areas continue to improve and become more informative, and stock assessments should respond to this evolution over time.	

model should be formulated so that the data for such fisheries do not have a large impact on estimates of population trend and size.		
8) Further explore methods for weighting purse seine length frequencies by catch.	Agree	
9) Further explore methods for the calculating longline size-composition data by weighting spatial data by long-term average catches.	Agree	
10) Length-frequency data for the Japanese longline fishery should be omitted from the reference model until these data are better understood and can be shown to be compatible with the associated weight-frequency data. Analysts should gain access to how training vessel trips and any other sampling programs are undertaken, and analyze the available data at the set-by-set level before these length-frequency data are considered for re-inclusion in the assessment.	Agree	A request will be needed from SC/WCPFC to Japan to seek access to these data. If access to these data requires travel to Japan then additional funds will be required.
11) Separate the training vessel length frequency data from the commercial data and create a "survey" length composition series to be included in the model.	Agree, this is a good idea. It is an approach adopted in the skipjack assessment to utilize longline training vessel data.	See above
12) A more appropriate method should be used to calculate the CVs for the Japanese CPUE indices (e.g. Francis' canonical method or prediction-based methods)	Agree	
13) Drop the region 5 tagging data unless the model can be re-structured to make the area where the Australian tagging took place in region 5 a separate region.	Agree. We also plan to carefully examine tagging data and model fits for both recent and historical tagging to determine if other issues exist. This will be complimented with analyses of mixing rates to determine the best way to	

	model tagging data.	
14) Available data on tag shedding should be examined and be used to provide a value for use in the assessment, noting that this may be challenging given the possibility of correlation between tag loss for each tag for double-tagged animals.	Agree. To date, modeling of double tagging data has not indicated continuous longer-term shedding to be an issue. Tag shedding is currently included (along with non-reporting, etc) in a general instant-aneous tag loss component.	
15) Tag loss and tagging-induced mortality should be modeled separately	Agree, although we note that specific estimates of tagging-induced mortality are not available.	
16) Future analysis of operational CPUE data should focus on how to identify targeting and investigate year-area interactions and the implications of increasing numbers of year-area cells without data.	Agree, and also note the additional point made in the main body of the report regarding the development of models to interpolate catch rates for cells with no data.	Analyses of Japanese operational data have been undertaken in collaboration with NRIFSF. These trips to Japan are expensive and do not provide the best environment to analyze these important data (i.e. the trips are short and we cannot retain the data for follow-up analysis). A request will be needed from SC/WCPFC to Japan to seek improved access to these data. If access to these data requires travel to Japan then additional funds will be required.
17) Use methods that simultaneously use both age-length and growth increment data, ideally within MFCL.	Agree, and note that this is important for other assessments, notably South pacific albacore.	
18) Continue seeding experiments due to the impact that reporting rates have on the present model configuration and estimation.	Agree, and this is being done with the cooperation of national observer programmes across the region.	These costs will be included within existing tagging programs while the funds are available.
19) Sensitivity analyses should continue to be shown to the assumed value for steepness and an appropriate means (e.g., a decision table) used to summarize the	Agree	

Review comment	SPC-OFP response	
management implications of uncertainty regarding steepness.		
20) The size of the stock recruitment penalty should be selected which allows the asymptote of the stock-recruitment relationship to be estimated, but is otherwise uninformative about stock size.	Agree	
21) Consider fitting the stock-recruitment relationship to the annual rather than seasonal recruitments.	Agree, and note that this capability currently exists in MFCL.	
22) The statistical weights for each data component (e.g., size composition, tagging, effort deviations) should be re-evaluated and revisited with each subsequent assessment.	Agree	
23) Future assessments should include both standard and historical retrospective analyses.	Agree	
24) Methods should be developed to provide output which accounts for uncertainty regarding the values for the factors considered in the structural analysis.	Agree, and this is been developed in the context of the 2012 oceanic whitetip and silky shark assessments.	
25) Stochastic yield functions should be presented because they may not indicate the same values for management reference points such as F_{MSY} and B_{MSY}.	This can be done, and we are currently finalizing coding for stochastic projections which could be used to generate stochastic yield functions.	
26) Projections considering MSY estimates should account for fishery-specific changes (i.e., likely proportional catches by fishery).	Agree, and note that this is currently done as a matter of course in projections, and fishery selectivity can be re-computed for each time step of the projection.	

MULTIFAN-CL

Review comment	SPC-OFP response
a. Test the options for time-varying selectivity – allowing for time-varying selectivity may address some	This is currently possible by specifying time breaks in fisheries, but we agree a more elegant

of the issues related to the sometimes poor fits to the length- and weight-frequency data.	solution using time blocks as in Stock Synthesis would be better.
b. Allow the length bins to be of different widths. One might, for example, want many narrow length bins for the smaller lengths, but fewer but wider length bins for the larger lengths. Allowing for a more flexible length bin structure should also reduce computational times as well as better reflect the available data.	Agree this would be useful.
c. Allow for long-term and initial tag-loss. Currently initial tag-loss is implemented by reducing the number of animals tagged when inputting data to the model and no account can be taken of long-term tag-loss.	Initial tag loss is also allowed through the reporting rate parameter. But agree that the addition of long-term tag loss, while it is not seen to be significant in the double tagging data available, would be useful.
d. Include an option which allows the tagging data to inform movement only rather than movement and mortality.	A tag likelihood conditional on tag recapture exists in MFCL but has not been used for WCPO tuna assessments.
e. Allow conditional age-at-length data to be included in the likelihood function. This will allow the ageing data from current sampling (e.g. WCPFC-SC6-2010/GN IP-04) to be formally included in the assessment.	Agree that this is a priority. Likewise for tag length-increment data.
f. Extend MFCL to allow gender to be explicitly represented. This will allow the impacts of differences in growth and natural mortality between the sexes to be represented. The current approach to modeling, for example, length-specific natural mortality (e.g. WCPFC-SC4-2008/ ME-WP-1) seems unnecessarily complicated given the lack of gender-structure in the model.	This development is close to completion in MFCL.
g. Create an output table which lists all of the likelihood components by fleet and automates the process of computing effective samples sizes (and other summary statistics related to model fit).	Agree
h. Allow for more general selectivity options, including selectivity patterns where the first age for which selectivity is non-zero is pre-specified. This should help to avoid selectivity being non-zero owing to the functional form for selectivity rather than data.	Agree
i. Include a "tail compression" option, which would pool all length- and weight-data for large and small sizes based on a specified percentage (e.g. all lengths would be pooled so that the "plus" length-class contained 0.1% of the length-frequency).	We probably need to discuss the merits of this further with the reviewers.

j. Add an option which allows the analyst to assume a multinomial likelihood for the compositional data in the first phases and only transition to the robust normal likelihood in the later phases.	Agree
k. When maturity data are based on length, converting to ages should be done within the model. Presently, the maturity-at-age is based on a fixed age-length relationship.	Agree
l. An option to add a likelihood weight to the tagging data component should be added.	Agree, although to an extent this exists through the over-dispersion parameter of the negative binomial.

References

Davies, N., Hoyle, S., Harley, S., Langley, A., Kleiber, P., and Hampton, J. 2011. Stock assessment of bigeye tuna in the western and central Pacific Ocean. WCPFC-SC7-2011/SA-WP-02.

Davies, N., Fournier, D., Hampton, J., Kleiber, P., Hoyle, S., Bouyé, F., and Harley S. 2011. Update of recent developments in MULTIFAN-CL and related software for stock assessment. WCPFC-SC7-2011/SA-IP-04.

Hoyle, S. D. 2011a. Research outline for longline catch per unit effort data. WCPFC-SC7-2011/SA-IP-07.

Hoyle, S. D. 2011b. Research outline for size data in WCPO length-based stock assessments. WCPFC-SC7-2011/SA-IP-06.

Ianelli, J., Maunder, M., and Punt, A. E. 2012. Independent review of the 2011 WCPO bigeye tuna assessment. WCPFC-SC8-2012/SA-WP-01.

Langley, A., Harley, S., Hoyle, S., Davies, N., Hampton, J. and Kleiber, P. 2009. Stock assessment of yellowfin tuna in the western and central Pacific Ocean. WCPFC-SC5-2009/SA-WP-03.

SPC-OFP. 2011. SPC-OFP response to the CIE review of the 2009 yellowfin tuna assessment. WCPFC-SC7-2011/SA-IP-05.