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SPC-OFP response to the CIE review of the 2009 yellowfin tuna assessment

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SPC-OFP[1]

[1] Secretariat of the Pacific Community, Noumea, New Caledonia

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Secretariat of the Pacific Community - Oceanic Fisheries Programme

Summary

During 2010 the US contracted two independent reviews of the 2009 yellowfin tuna stock assessment undertaken by SPC-OFP. This report outlines the response of SPC-OFP to the contents of those reviews. For the most part, the recommendations in the reviews relate to improved data collection and rather than the stock assessment methods used. For future CIE reviews, we recommend that SPC-OFP be consulted over the list of documents to be provided to the reviews to ensure that they have access to all necessary material.

Background

The US routinely obtains independent reviews of stock assessments relating to fisheries that they are involved – both domestically and internationally. One way that these reviews are conducted is via the Center for Independent Experts[2] (CIE). The CIE contracts fisheries stock assessment experts worldwide to participate in the reviews. During 2010 the US contracted two independent reviews of the 2009 yellowfin tuna stock assessment undertaken by SPC-OFP (Langley et al. 2009). The reviews were undertaken by Dr's Malcolm Haddon (Australia) and Jean-Jacques Maguire (Canada). The reviews were undertaken 'desktop-style', in which the reviewers are provided with the stock assessment documents and selected background materials.

SPC-OFP were not aware that the reviews were occurring and were not contacted by either CIE or any of the reviewers. While this independence is important, it appears that the reviewers were not provided access to all the necessary background documents for the review. This is reflected in some of the reviewer's comments.

In the remainder of this report we summarize the reviewer's comments under each of the terms of reference (ToRs) that were assigned to them by the CIE and then the SPC-OFP response. We include only those comments that require a response from SPC-OFP – not those that do not, e.g. any that suggest that current approaches are sufficient etc. Not all ToRs resulted in specific comments of recommendations. The review of Maguire was harder to follow than that of Haddon so it is possible that we may have missed or miss-interpreted some of his comments.

[2] http://www.ciereviews.org/

Review comments and responses

1. Comment on the adequacy and appropriateness of data sources for stock assessment.		
H	*There would be value in reviewing the various data series, as has been done for the purse seine fishery catches, to increase confidence that all that can be one has been done.*	Research plans for further examination of longline CPUE and size frequency data were discussed at the Pre-assessment workshop. Work, for example, in terms of fisheries definitions is ongoing.
H	*Initiatives aimed at improving the detail and resolution of data as it is currently collected should be pursued.*	Many DWFN WCPFC members have still not yet overcome their domestic constraints for operational data provision. Some collaborative arrangement for joint research exist, but are not ideal due to travel costs and the short time periods to complete analyses. This is is outside the control of SPC-OFP.
M	*It is difficult to evaluate their (catch, effort, and size data) relevance / usefulness / reliability as the basic data are not presented in a way that is amenable to evaluation. Show in the first few tables total catch by year and area, by gear, by country, etc.*	SPC-OFP notes that the stock assessment data files are publically available (http://www.spc.int/oceanfish/en/ofpsection/sam/sam), as is a MFCL viewer (from the MFCL website http://www.multifan-cl.org/) to examine data inputs and results. So many of the outputs and inputs are already available to interested parties. Further, a set of R-functions are also available for interrogating the data and output objects to extract quantities of interest (http://code.google.com/p/r4mfcl/). The PAW recommended not increasing the length of the assessment reports to address these comments, but reinforced the current approaches for dissemination of model results. It did recommend that production of excel files which could contain some of the key model outputs – for those who were unable to use R.
M	*The most important results (yearly estimates by age of population numbers, fishing mortality, and biomass) are normally also provided in a tabular form, not only in figures.* *It would also be useful to show the actual length / weight frequencies by year for each fishery.*	
M	*There appear to remain important uncertainties however about the most basic of these data - catch. This should be rectified*	Research is ongoing to reduce uncertainty in purse seine (through the spill sample trials) and Indonesia / Philippines domestic catch estimates (GEF-WPEA project)
M	*What was the basis for the exclusion of key size data from the assessment (WPCFC SC5, 2009, paragraph 39, attachment L)*	This was described in detail in both the 2007 and 2009 YFT assessments – it relates to ensuring that the length/weight samples are coming from the same areas as the bulk of the catches.
M	*Should nominal effort levels be used in situations where only catch data are available?*	This assumption is no longer required in MULTIFAN-CL – either catch or effort can be set to missing as required, but we do need to have some effort information if future projections of other than catch are required.
M	*How are quarterly length frequencies derived for the principal longline fisheries?*	These data are submitted by DWFN's to the Commission so SPC-OFP are not able to comment.

2. Review the assessment methods: determine if they are reliable, properly applied, and adequate and appropriate for the species, fisheries, and available data.		
M	*It would be useful to ground truth the results with simpler methods, e.g. production models, or simple tests like plotting total catch versus an index of total effort (if one can be calculated).* *"... estimate of total catch at age and use it in a VPA to back-calculate historical population and mortality estimates. ... it would provide an easy ground-truthing of the absolute estimates of stock size and stock size trends."*	SPC-OFP would be happy to collaborate with interested parties wishing to use MULTIFAN-CL inputs (or outputs) to run alternative models. But, we note that some of the assumptions of these simpler approaches are likely to be seriously compromised. Further there are some potential philosophical questions around using the outputs from one assessment as inputs for another as a method to test the first.
3. Evaluate the assessment model configuration, assumptions, and input data and parameters (fishery, life history, and spawner recruit relationships): determine if data are properly used, input parameters seem reasonable, models are appropriately configured, assumptions are reasonably satisfied, and primary sources of uncertainty accounted for.		
H	*The assessment exhibited weaknesses with respect to how growth is estimated ... this is a significant problem that needs attention.*	Growth estimation is an important area of development in the assessment. The estimation of age composition of catches (through direct ageing) will be important to reducing any uncertainty. Other scope for analysis include the tagging data and fine scale analysis of modal progression in surface fisheries. In terms of MULTIFAN-CL development – progress to develop a two-sex model will also allow greater scope for growth estimation. The proposed research plan for size data was presented to the PAW and includes relevant activities.
H	*The new method of calculating reproductive potential appears to be a marked improvement .....; however, this is an area that also needs further exploration and its implications for the model outcomes, particularly in performance measures involving spawning biomass...*	SPC-OFP can only assume that the reviewer was not made aware of the detailed SC papers on this topic. Three papers have been written on this new approach for SP-ALB, BET, and YFT. The most thorough sensitivity analyses were described in the BET paper (SC4-ME-WP-01).
M	*The influence of using a growth curve in agreement with the tagging results should be investigated.*	This is planned under the size research plan presented to the PAW
M	*Knowledge may exist, however, to crudely estimate different migrations by age / size outside the modelling framework which would be an improvement over the current assumptions.*	MULTIFAN-CL is currently under development to allow the assignment of priors to the movement parameters to allow more flexible estimation.

M	*The reason for the changes [to reproductive potential] should be explained more fully and the effect on the stock recruitment relationship or on SSB trends should be discussed.*	See previous response
M	*Further investigation of possible changes in catchability should look at the fishing practices and methods over time to identify major events. Catchability may in fact change in a stepped manner from time to time rather than being a continuous process.*	This is included in the CPUE research plan discussed at the PAW, but with respect to longline this is currently hampered by the lack of operational catch and effort data for many important fleets and the very low levels of observer coverage. Hopefully the 5% levels of longline observer coverage agreed by WCPFC will allow for more information in the future.
4. Evaluate the adequacy of the sensitivity analyses in regard to completeness and incorporation of results.		
5. Comment on the proposed population benchmarks and management parameters (e.g., MSY, Fmsy, Bmsy, MSST, MFMT); if necessary, recommended values for alternative management benchmarks (or appropriate proxies) and clear statements of stock status.		
H	*It appears that decisions still need to be made over what performance measures to use as a summary of stock status and to provide management advice.*	The Commission and its SC are embarking on a process to determine appropriate target and limit reference points. The former will require considerable input from managers.
H	*If a decision has to be made about which measures to adopt or to move to, then it is recommended that the management decisions that might derive from using the alternatives be considered retrospectively for a number of years so that an informed decision can be made that can be agreed to by all members of the WCPFC.*	This is mostly covered in the terms of reference for the reference point work. The use of this in formal retrospective analyses will be considered, but time constraints may be a problem in 2011 as the WCPFC requested that the 2011 assessment be used for projection analysis for SC7.
M	*While there is no objective basis to choose a value for steepness within that range using a hockey-stick approach rather than a B&H relationship might prove a pragmatic solution to this dilemma.*	SPC-OFP does not agree that there is no objective basis to choose a single value of steepness. Incorporation of "Hockey-stick / broken-stick" curve for spawner recruitment relationships may be considered for inclusion in MULTIFAN-CL. The implications of this functional form for reference point estimation will be important consideration.
M	*Rather than be based on MSY estimates, management advice could be based on surplus production estimates.*	*The key stock status advice provided by the SC to the Commission is typically in terms of biomass and fishing mortality levels rather than catches.* *Nevertheless, if resources allow SPC-OFP can provide estimates of annual surplus production for the three tropical tuna assessments in 2011.*
6. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status.		

7. Suggest research priorities to improve our understanding of essential population and fishery dynamics necessary to formulate best management practices.		
H	*Of immediate value and concern is the consideration of the integrity and accuracy of the various catch series.*	SPC-OFP has little present scope for validating historical longline catches, but catch estimates from purse seine and the fisheries of Indonesia and the Philippines are currently under evaluation.
H	*Methods used to standardize the longline catch rate data and the relationship between longline catch rates and yellowfin tuna abundance*	A key component of the SC research plan
H	*Work is needed to characterize the growth of the younger age classes across the regions and the means for including that in the assessment.*	Discussed under the "model configuration"
M	*Reliable estimates of total catch, increased sampling of the most important gear and areas, and well – designed large scale tagging program to better define stock structure and understand migration pattern.*	Agree

Conclusions

SPC-OFP also noted the following comments Dr Malcolm Haddon:

> *"The authors of the 2009 assessment have made a real effort to pre-empt critical review by including diagnostics and their own critical review of the strengths and weaknesses of the assessment. They identified where the data were weakest, where the model fits were poorest, and which assumptions and structural decisions were most influential. With this list in mind they were also able to include a list of the most valuable future research and extra data gathering that could be conducted to improve the assessment. This is an excellent assessment that provides a fine example of how to present a complex assessment to a wide audience.*
>
> *The data sources for the assessment were appropriate and, although there can always be more data at a better resolution and with more detail, it proved adequate to provide an assessment that can be used to assess the status of the yellowfin stock in the western and central Pacific Ocean."*

And comments from Dr Jean-Jacques Maguire

> *"Having been developed specifically for tuna species in the Pacific Ocean, the assessment method is clearly adequate and appropriate for yellowfin tuna and the fisheries exploiting it, and it is well suited to the data available for this assessment. The method seems to have been properly applied. The results can be assumed to be reasonably reliable, but relatively large changes in important fisheries management parameters in successive assessments suggest that the results should be used with care.*

All model assumptions seem reasonable, but it is also clear that none of the assumptions is fully satisfied. Similarly, the data seemed to have been properly used, but data are variable and seem relatively scarce. The fact that all model runs presented show more or less the same trends may give a false sense of security. Exploring what changes would be required to produce radically different results might give a sense of the robustness of the results.

The sensitivity analyses of the base case adequately cover the range of possibilities of the model used.

The determination that yellowfin tuna in the Western and Central Pacific is not overfished and that overfishing is not occurring is consistent with the data and seems reasonable, in a relative sense, based on the analyses and sensitivities. This does not mean, however, that the absolute values of BMSY, SSBMSY, and FMSY are estimated precisely."

References

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. Report from the SPC pre-assessment workshop, Noumea, April 2011. WCPFC-SC7-2009/SA-IP-01.