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To: Working Part on Temperate Tuna
From: Dr. Rishi Sharma, IOTC Stock Assessment Scientist
Date: 18th August, 2012.
Re: CPUE Standardizations for Korea for the Albacore Assessment

Some of the key issues that were pertinent to the Japanese and Taiwanese analysis from 2011 seem pertinent to Korea in 2012. As such the following probably need to be addressed in some manner before the use of this data is possible in an overall assessment:

1) Korea is using 5 by 5 degree data and this possibly needs to be reduced to a finer spatial scale (like what Japan did in 2012). In addition, using operational data is better than using data that is aggregated on this resolution so as not to miss any key signal that may be available in the data.
2) It isn't clear whether targeting of other species is primarily the reason for the decline (like Japan), or is it a real effect. Likewise, the consequential increase isn't entirely clear whether it is targeting of a species effect or some other reason.
3) Table 1 shows Quarter not being an effect. Was it used in the final model as interactions are all significant?
4) Is this an unbalanced data-set? If this is the case, order of the analysis would be highly influential in the outcome. As these models are quite complicated, and are most probably of an unbalanced design, how did you deal with the order and interaction terms in the final model? Please present the results along with parameter estimates as we can see the effect of time, area, etc.
5) Figure 6, residual error shows that the error structure is leptokurtic (not explaining the tails well which really drive a lot of the declines and increases). As such, it appears that the model is over estimating low abundance (or zero values) and underestimating the higher values.
6) Large divergence in 2010 from the Japanese data set. This point should be checked as it may be due to incomplete data or some other effect.

As suggestions I would examine the full model and then standardize the signal obtained from the full model. In addition, I would examine the effect of using the delta distribution. The use of Delta distribution (delta lognormal model, Pennington et. al. 2002, Lo et. al. 1992) can lead to more efficient estimators of mean and variance because non-zeros are assumed to follow a log normal distribution and zeros are treated separately. In addition examining a Negative binomial Model would be useful as well. Examining this as a Poisson model treating each observation as counts and using effort as a covariate may be another alternative. In addition, using things such as the Box-Cox transformation to justify application of the log-normal as the appropriate response may the best way to go.

Finally, examining a sub-set of the log-book data may be more informative then using all the data especially when other species were being targeted if that information is available. As far as possible, you want to have a data-set that is invariant to these external factors that determine the CPUE. If this can be examined, along with some continuous covariates (in a richer dataset if available, if depth, vessel type, etc. was available) then the analysis may give a very different picture (Maunder and Punt 2004). Finally, how you weigh this data in a final assessment will eventually determine the outcome of the stock assessment (Schnute and Richards 2001).

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Schnute, J. T. and L. J. Richards, 2001. Use and abuse of fishery models. Can. J. Fish. Aquat. Sci. **58:** 10–17.