

## **Summary Report of the CPUE web meeting held on the 25/26 April 2013**

Prepared by John Pope (Advisory Panel) chair of the CPUE modeling group.

### ***Introduction***

***A web meeting to discuss and forward CPUE issues was held 25/26<sup>th</sup> April, 2013. This report is based upon the informal record and the verbal record contained in the video of the meeting both available on the CCSBT website which should be consulted for more detail.***

***The chair welcomed participants (see annex 2 of the informal record for the participant list) at about 2330h gmt on the 25/4/13 and the agenda was agreed (see annex 1 of the informal record for an annotated agenda). There were two major agenda items for discussion, the immediate concern of checking that the current base series continues to behave adequately and to develop and encourage new work on CPUE series.***

### ***Immediate concerns.***

#### **Agree Monitoring Series.**

The chair noted that with a midterm OMP meeting in Portland scheduled it is obviously important that we are comfortable that the standard CPUE series is behaving reasonably. Hence we should make plans for comparison of standard series with existing monitoring and with new monitoring series and also agree proposals for checks on fleet behavior.

It was agreed that the motivation for producing monitoring series was to have a small number of plausible series whose trends could be compared to that of the base model series. Deviations between these would provide an incentive to seek explanations for differences and hence subject the base series to the proper degree of quality assurance. Various possible monitoring series were proposed. After considerable discussion it was agreed that the following series should be constructed and used to compare with the base model series. These were as follows

- 1. The Base Model but without bycatch terms (i.e. with the YFT and BET terms removed)***
- 2. John's bycatch model (as 1 but including the proportion of hauls with zero SBT as a by-catch indicator) (John to provide an exact specification)***
- 3. The Base Model with all interaction terms removed (main effects only). In passing we note that in this case the main year effect might be treated as a series in its own right as well as being subject to the usual CS and VS weightings.***

These first 3 series are well defined and perhaps Itoh-san could provide them with help if as necessary but. The following two are more tentative and will require developing.

4. Leave interaction terms in but treat them as random effects  
(– Year x month, area x month). (Could Mark help with providing this?)
5. Use GAM / spatio temporal splines to provide new series, Campbell, Mark and Richard will consider this possibility.

It was also noted that the 1°X1° and the haul by haul series that Itoh san provides might also be seen as monitoring series.

#### **Agree proposals for checks on fleet behavior.**

*Itoh-san was requested to provide us in his annual paper on this subject to the ESC.*

*There were also requests to the technical group to:*

- Provide updated data (age data by area, year)
- Produce Cohort-bubble plots by area

#### **New work.**

A further of the purpose of the web meeting is to encourage the development of new CPUE data and new ideas for the analysis of CPUE series. Sub items considered under this heading included,

- to plan a comparison of Taiwan CPUE by area with the Japan CPUE,
- to see plans for any analysis of Korean CPUE data,
- to discuss new ideas for CPUE work and series, and
- to decide if the use of longline research sets could be a basis for providing consistent time/area distribution of longline CPUE.

#### **To plan a comparison of Taiwan CPUE by area with the Japan CPUE.**

Sheng-Ping reported that progress is being made with this project. He was taking up a previous suggestion to adopt some way of working by standard vessel similar to the core fleet approach used in the Base model. There may however be problems with matching Taiwanese and Japanese data by area. It was noted that the Taiwanese fleet has a more multi-species and it may help to correct SBT CPUE with bycatch terms. These corrections for bycatch should be applied in same way as used for the Japanese fleet.

It was noted that in the past Taiwanese CPUE had exhibited different trends to that of Japan. One possibility was that the Taiwanese fishery was conducted further to the north and was thought to catch smaller fish. Hence it would be helpful if CPUE could also be examined by size in a similar way to the examination for the Japanese fleet

It was suggested that the depth of fishing operations is a indicator of the species targeted. It was noted that Depth may not be available as a covariate for the Taiwanese data analysis but if it is, it should be used.

It was further suggested that it would be helpful to produce diagnostic plots of the Taiwanese CPUE data. In particular plots similar to the area and month intensity of fishing produced in Itoh-san's report to ESC would help us understand changes in the Taiwanese fishery that might influence trends.

### **To see plans for any analysis of Korean CPUE data.**

Korea reported that explorations of their CPUE data are underway to see if they can be used in a standardization. Korea noted that the time series is short (since 1990s). Factors that may influence catch rate such as Fishing patterns and numbers of hooks per basket etc. are being examined. It was hoped that the analysis could be completed for review by end of May (Technical team to provide help if requested).

The group recommended looking at these data in a similar way to the Taiwanese data and Japanese data. It was noted that having Taiwanese and Korean series would provide another way to compare trends with the Base model and provide reassurance or to raise questions.

### **To discuss new ideas for CPUE work and series.**

Mark presented Paper 3 which shows a first attempt at smoothing CPUE estimates. Results suggest that the annual Base model CPUE indices are perhaps more variable than we would hope. The model also showed that some year's indices changed as more years data became available (i.e. showed a retrospective pattern). In discussion it was noted that this should be very useful as a diagnostic tool. However, a concern was raised, noticing that CPUE are in numbers, that potentially we lose the signal from young ages in smoothing CPUE. A concern was also expressed about using smoothed data as inputs to the population model. Instead, it was thought better to use "raw" CPUE within the model and have the model do the smoothing. Strictly we should input the covariance matrix of any data to the population model. In practice we only use the variance. It was noted that a virtue of our present practice of using a GLM to preprocess the raw data is that its covariance terms are typically small and may be fairly safely ignored. It was not clear if this would also be the case for GAMs etc.

Thus, the Author was encouraged to develop this approach further as a diagnostic tool in the first instance.

John Presented Paper 1 and then Paper 5 which extended the thinking of Paper 1. The author illustrate the point that differences in catchability between areas might distort CPUE indices if variable proportions of the stock were found in such areas. For example the recent recolonization of the Tasman area by SBT could be an example where a difference in catchability could distort a CPUE series. He then looked at simple ways to correct for such problems but found that while simple approaches such as geometric means or finding weightings between areas that maximized autocorrelation worked on the simple example presented in Paper 1 they did not work on real multi-area CPUE series. The reason why autocorrelation maximization did not work for SBT series was that the 35 south band of Area 8 had far higher autocorrelation than any other area and hence got

100% of the weighting. He noted also that variable squares estimates had similarly high autocorrelation when compared to constant squares estimates and that this was a curious observation that was worth further investigation. Having failed to correct the Base model type of analysis he then turned to age based analyses using the Shepherd-Nicholson approach that he had presented at the previous ESC. This was used to provide a smoothed year signal. Comments on the later point were rather similar to those made to Paper 3 about the risks of smoothing CPUE outside of the population model. It seemed likely therefore that the age based approach at least as shown might be more useful as a diagnostic tool than as an alternative input. The author would look again at the way the age based signal was produced. He also noted that given age based data it might be sensible to produce age based CPUE indices.

John then presented Paper 4. This described ideas for developing a CPUE model more related to the migratory behavior of the SBT. The recent Australian tagging work on juvenile fish suggests that they move in a series of circuits between the GAB and feeding areas such as South Africa, the central Indian Ocean etc. There is also the suggestion that they may switch their feeding circuits. Modeling, what proportion of the stock occupied each circuit, where we would expect the centre of concentration of the fish in each circuit to be at a given date and how fish would be distributed about this centre would give a basis for predicting the likely catch rates by 5°x 5° cells by year and month. It would give predictions of catch by area, year and month similar in type to those given by the combined terms of the Base model. In the first instance such a model might give us a way of simulating plausible CPUE data for testing other models.

In discussion it was pointed out that the recent Australian archival tag work was focused upon juvenile fish, predominantly 2 and 3 year olds while the commercial CPUE was based upon older fish which would likely have different migratory behaviors. Indeed the ability of the industry to focus on a large incoming yearclass might well suggest that younger fish behaved somewhat differently to older fish. The author agreed that this was a problem and that it was quite probable that older fish had different migratory behaviors with perhaps bigger fish being able to forage further south and certainly mature fish having to take in the spawning grounds in their migrations. The model would need to accommodate these differences which would argue for fitting the model by size groups. He did not foresee the Australian tagging results being used as data in such a model but the picture they presented was very helpful in forming sensible priors for the migration circuits. It was pointed out that some earlier Australian archival tagging had been conducted on large (160cm) SBT and relevant papers could be made available to help inform this model. The author noted that if changes in the migratory circuits could be seen with time or changes in abundance then this might help us to understand the CS versus VS question. The suggestion was made that a first task might be to look for correlations between what was expected from tagging data and the CPUE data.

**To decide if longline research sets could be a basis for providing consistent time/area distribution of longline CPUE.**

Paper 2 by Sakai-san and Itoh-san was introduced by the chairman who asked the authors to expand his presentation of their work which showed which cells have been most consistently fished in which months in past years and gave trends in CPUE in consistently fished cells. It was noted that this work was useful both in providing some idea of where consistent time series pre existed and also in providing some idea of the between shot variation that might be expected from a commercial long line survey if one were conducted. This would inform any survey design exercise of the likely amount of effort that would be required to achieve a given survey precision.

The group then discussed the questions that the chair had proposed to Doug and Campbell. These were

- 1) Are there any previous examples of this approach used elsewhere -
- 2) Is the objective
  - a) to provide an alternative CPUE series?
  - b) to check for changes in fish distribution i.e. explore CS versus VS?
- 3) In either case how would we estimate variation of individual hauls? How many shots we would need a year to provide a viable program?
- 4) Finally could fishermen take any plan on board without unduly disturbing their commercial operations? How they would need to be compensated / incentivized to do it?

In answer to question 1 Campbell described a previous design exercise for such a survey (See Davies, CPUE/2013/Info01). This suggested that the problem was scientifically feasible but the plan has not been used in practice.

With respect to question 2 option a) was most favored since it was felt that option b) would require much greater sample sizes to detect such "more complex" effects with certainty.

With respect to question 3 the design study discussed under question 1 suggested about 250 shots per year would give reasonable precision which concurred with the chair's estimate based upon experience of bottom fishing surveys.

Question 4 was seen as being the key question since unless the industry were whole heartedly in favor of such a survey it would not succeed. Hence, it was decided to have scientists in member countries ask their industry informally if some form of standardized directed effort for CPUE purposes is at all feasible. Given the key position of the Japanese fleet in SBT fisheries it was decided to first focus on the possibility of the Japanese industry being willing to participate. (Japanese members are asked to make informal contact with their industry)

## **Closure**

The chair reminded members that it would be possible to hold a further Web Meeting prior to the ESC if for example any problems emerged with the latest data point of the Base series. (Itoh-san was asked to keep us informed if he became aware of any problems). There being no AOB the meeting closed just after 0130h gmt.

### **List of Working Papers for the April 2013 CPUE Web Meeting**

Document Number	Submitted by	Title
	John G. Pope	Agenda - CPUE web meeting scheduled for the 25/26 April
CPUE/2013/00	Secretariat	List of Working Papers
CPUE/2013/01	John G. Pope	Note On A Potential Problems With Year Interactions In CPUE Models
CPUE/2013/02	Osamu Sakai and Tomoyuki Itoh	Searching of consistent time/area distribution of Japanese longline operation from 1986 to 2012
CPUE/2013/03	Mark Chambers	Proposal for a Retrospective Study of the Effect of Temporal Smoothing on Projections of Future Spawning Stock Biomass of Southern Bluefin Tuna
CPUE/2013/04	John G. Pope	Towards An Improved CPUE Model for SBT?
CPUE/2013/05	John G. Pope	Part 2 of a Note On A Potential Problems With Year Interactions In CPUE Models
CPUE/2013/Info01	Dale Kolody, Campbell Davies and Rob Campbell	Development of ETBF Longline Surveys: Introduction and Design Concepts