Report of the 15/16 April 2014 CPUE Web Meeting of the CCSBT CPUE Modelling Group.

1). Welcome and agree agenda.

The meeting opened at 2330h BST. The chair welcomed the participants (see appendix 1 for participants list) and agreed the agenda with the participants (see appendix 2). The Chair (JP) had as usual prepared a summary of the papers and proposed he should mostly present this and the authors amplify this presentation and answer questions while JI would show these from his desktop. The slides are available on the CCSBT website as are the written and video record of the meeting.

2). Checking that the current base series continues to behave adequately.

The Chair presented Paper 1 "Correction of the core vessel dataset for SBT CPUE."
by TI Japan. This corrected several minor errors that had existed in the CPUE data set. These were:-
1. Correction of ID of N. Z. chartered vessel.
2. Corresponding of catch to age comp.
3. Correction of data input of west longitude.

The chair clarified three technical questions with the author and thanked him for his careful concern with maintaining the quality of the data set. The meeting considered that none of the corrections generated significant changes to the past results.

The Chair presented Paper 2 "Change in operation pattern of Japanese southern bluefin longliners in 2013/02." by TI Japan. This is the paper produced annually to check for changes in operation of the Japan LL fleet particularly since 2006, examining:-
1. Changes in fleet statistics and fish size.
2. Changes in time and space operated
3. Concentration of area operated
4. Consistency of vessel operation
5. Proposes new measures in annex 1

It was noted that the number of operations had decreased while CPUE had increased. DB suggested that we might need to consider any effects of new vessel (and skippers) entering the fishery when the quota increased. It was thought that this might be best discussed in the margins of the OMMP meeting in Seattle and at the ESC. Overall the numbers of 5*5 fished had decreased a little and slightly less 1*1 degree squares were fished per 5*5 degree square. Both these suggest slightly increased concentration. The author clarified that an individual vessel fished fewer1*1 cells but that the number of 5*5 cells fished by the whole fleet was less changed. Viewed by area the concentration index showed increased concentration in area 6 but reduced concentration in area 7 where fishing had increased. There was little obvious trend in the other areas. There seemed fair

consistency between the vessels fishing in the period 2001-2005 and in 2006-13 with an overlap in the vessel list of about a half. It was noted that not all data, particularly that from NZ was yet available from 2013 and that figures would be updated for the ESC. The author proposed some new presentations that would show the centre of gravity of fishing effort. The meeting welcomed these ideas and hoped that these figures could be available at the ESC. The meeting notes that while there continues to be a slow change in the behaviour of the Japanese LL fleet, mostly an extension of the dates of operation, nothing in the results of paper 2 seemed likely to compromise the continued use of these data in the OMMP. The Chair thanked the author for preparing this useful paper.

3. To develop and encourage new work on CPUE series.

The chair asked the members from Taiwan and Korea for a progress report on the development of their national CPUE series. Both countries reported they were in discussion with Japanese colleagues about analysis of their CPUE. Both hoped to present results to the ESC and if time allowed to also discuss progress at the OMMP meeting in Seattle. Taiwan was awaiting their 2013 data which were not yet available. The chair noted that since the Taiwan CPUE was mostly of younger ages of fish it would be interesting to compare it with the Australian Aerial survey series.

The chair invited the author (MC) to present paper 3. "An updated GAM for SBT CPUE.". This provided a revision of his last paper on the use of GAMM to smooth CPUE data. However, due to technical problems with the sound system this was not possible and the chair gave a brief introduction using his own slides and the author provided text clarifications and answers to the meeting. The chair noted that the paper updates the 2013 GAM model

$$CPUE_{lo,la,m,y} = s(LONG_{lo}, LAT_{la}, MONTH_m) + s(LONG_{lo}, LAT_{la}, YEAR_y) + YEAR_y^* + \varepsilon_{lo,la,m,y}$$

following suggestions made in 2013 to:-

$$\log.CPUE_{lo,la,m,y} = s(LONG_{lo}, LAT_{la}, MONTH_m) + YEAR_y^* + 1 | (Cell_{lo,la} : YEAR_y^*) + e_{lo,la,m,y}$$

• With ε now a normal variate.
• The first term allows an area month smoothing over all years.
• The second is a general year effect
• The third a random effects change in distribution by year.
It was noted that the structure of the model which smooths CPUE data over all included squares would likely make its results closer to the constant squares results from the base model. The comparison with the results of the base model also suggested this to be the case. In principle it would be possible to exclude unfished cells from the total to give a variable squares equivalent however perhaps the main point is that this analysis, although prepared to a very different model closely mirrors the results from the 0.8 base series results, thus suggesting that the precise choice of model does not greatly change our view of the trend of the CPUE results. The chair thanked the author for his work.

The chair also presented paper 4 by MC "A CPUE model for SBT with Interactions as Random Effects."

This provides the random effects model proposed as a monitoring series.
The base model is fit with random effects as

$$\log(CPUE + 0.2) = Intercept + Year + Month + Area + Lat5 + 1 \mid Month : Area + 1 \mid Year : Lat5 + 1 \mid Year : Area + Error$$

Random effects terms are indicated by 1| but note while otherwise similar in structure to the base model that so far this model is without bycatch terms. Results are combined in to cs and vs as in the base model. It was noted that this model gave similar results to the base model. Various technical suggestions were made to the author concerning diagnostic tests and tests as to whether Random effects were most appropriate. The suggestion was also made that the Month Area interactions might possibly be considered as fixed effects while the others were more likely Random effects. The author said he would consider these suggestions and respond by email. The Chair expressed his gratitude to the Author for his work which finally produced a series that we had wished to see for some time.

The chair presented his own paper 5 "A note on the Shepherd-Nicholson fit to CPUE at age data with extensions to examine any 2008 anomaly."

In this paper a Shepherd-Nicholson model is fitted to the CPUE data by age, year and area categorical factors. The "best" model is:-

Ln (CPUE) = YC + A:AREA + Y7B + trend:AREA + ε , {called model pp13}

Where YC is a year-class factor, A an age factor, AREA a statistical. area factor and Y7B a 7 year time block factor and trend a linear trend acting only on years post 2005. the error term ε is taken to be normal.

An alternative model with year effects (tt) post 2005 allowed to vary annually instead of the trend variable was also fitted as:-

Ln (CPUE) = YC + A:AREA + Y7B + tt:AREA + ε , {called model pp14}

With tt used as a factor for the years post 2005 this did not improve fit. This suggests that the 2008 point is part of a general increasing trend (perhaps due to reduced F in these years?) and hence a run of upq 2008 may not be needed at the OMMP meeting. There were also technical questions about both the model structure and the error distribution and about the differing age effects in different statistical areas. It was agreed that it would be useful to compare the results of this simple model with the results of the assessment model at the ESC.

The chair apologised that he had not been able to progress the migration model he had proposed last year. However, he reiterated his belief that developing age or length based models of CPUE might be the best way to progress with the CPUE work and there was support for this view. A possible initial approach would be to make size disaggregated

runs of the base model. There was also a suggestion that the broader motivation for migratory CPUE work should be discussed in the ESC and that eventually this might be facilitated by considering spatially dis-aggregated data from a more highly evolved operating model.

4. Any Other Business

The chair asked Japan if it would be possible to provide to the OMMP meeting the various monitoring series he had proposed in his circular letter for this meeting. TI agreed to do this if time allowed. There were no other AOB items.

5. Closure

The Chair thanked to authors for their papers and the participants for their useful comments. The meeting closed at about 0100h BST time.

Appendix 1 Participants
Bob or Colin to provide please.
Appendix 2 Agenda
Agenda for CCSBT WEB
MEETING 15-16 April 2014-04-15
1. Welcome Members and agree agenda
2. To check that the current base series continues to behave adequately. See Papers #1,#2
3. To develop and encourage new work on CPUE series. See Papers #3,#4,#5
4. Any Other Business
5. Closure