Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of
The Fifth Operating Model and Management Procedure Technical Meeting

24 – 27 June 2014
Seattle, Washington, U.S.A.

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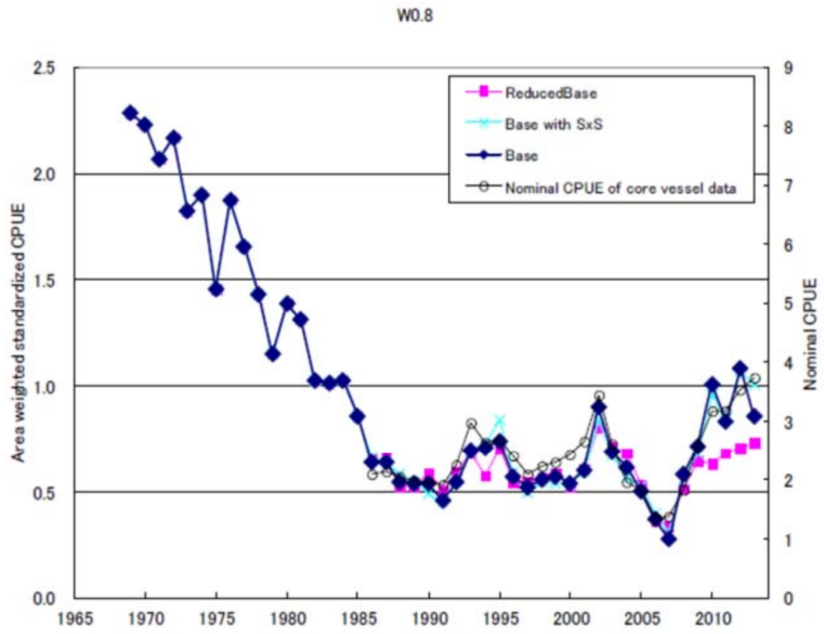
Opening of Meeting

1. The Chair of the Fifth Operating Model and Management Procedure Technical Meeting (OMMP), Dr. Ana Parma opened the meeting and welcomed participants.
2. The list of participants is shown at **Attachment 1**.
3. The terms of reference (CCSBT-OMMP/1406/01) agreed for OMMP5 by the ESC in 2013 were reviewed. The meeting agreed that items 3 b, c and d would not be addressed at this meeting, and item 3g (*Evaluate how to incorporate within-cell uncertainty in OM grid)* would be addressed, if possible. In addition, item 5 was deferred to the ESC meeting in September, as there had not been sufficient resources to consider this issue prior to OMMP5.
4. The draft agenda was discussed and amended and the adopted agenda is shown in **Attachment 2**.
5. The list of documents for the meeting is shown in **Attachment 3**.
6. Kevin Sullivan and Campbell Davies agreed to co-ordinate the preparation of the report with Jim Ianelli.

Agenda Item 1. Evaluation of OM results using updated data and estimates of unaccounted catch mortality.

1.1 Incorporation of new data

7. ***CPUE investigations***: John Pope reviewed the findings presented at the CPUE webinar held in April 2014. Five working documents were presented and discussed at the webinar meeting. The report from the webinar is summarised in **Attachment 4.** At the webinar it was agreed that the current CPUE base series was satisfactory. Specific to the OM conditioning, an evaluation of the "UpQ" scenario affects the consideration of topics under agenda item 1.4.
8. OMMP/1406/13, the Japanese core vessel CPUE analyses was presented. Sensitivities showed that when year interactions were dropped, referred to as "Reduced Base", the result in the last five years differed from the base series (Figure 1). To investigate this difference the following diagnostic was suggested: For the constant-squares model the Area effect for each year be summed over month and area for the 4 latitude bands and similarly the Area effect was summed over month and latitude for each of the 6 areas to see how much the trends differed.



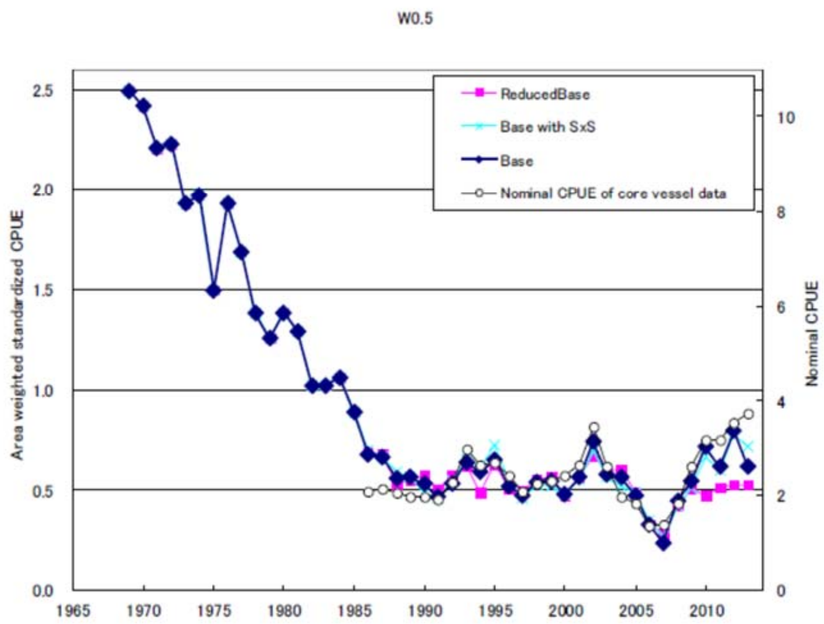


Figure 1. Area-weighted standardise CPUE and nominal CPUE of core vessels (from paper OMMP/1406/13). ReducedBase does not include year interactions.

9. It was noted that the number of 5x5 cells that had been fished by the core fleet had declined since 2008 from over 115 to about 80 cells in 2013 and that this decline was more substantial in the number of 1x1 cells fished over the same period (90-57 cells). Further examination indicated this contraction had largely occurred in the higher latitudes.

10. Following examination of the analyses conducted during the meeting the meeting agreed that the reduced base should be kept as a sensitivity run for the 2014

assessment and further exploratory analysis be conducted to investigate the potential processes that were driving the differences between the two series.

11. ***Aerial survey:*** the results from the 2014 scientific aerial survey were presented (Figure 8, OMMP/1406/4). The 2014 point is the highest point of the series. More fish were found in the western Bight than in previous years, a feature not seen since the early 1990s. On the basis of raw survey data the total biomass was similar to the 2013 survey. However, the proportion of 1-year olds had declined substantially in 2014 relative to recent years, e.g. 30% in 2011 to 4% in 2014 (Table 1). The 2014 index was much higher than 2013 after standardisation for environmental variables and spotter calibration. Conditions in 2014 had higher haze and cooler water than in 2013.

Table 1. Percent of schools in each survey year comprised of fish estimated to be less than 8kg on average (assumed to be 1-year-olds).

Year	%	Year	%
1993	0.2	2006	0.7
1994	7.4	2007	0.0
1995	8.8	2008	0.7
1996	3.7	2009	13.1
1997	8.2	2010	16.1
1998	6.2	2011	30.7
1999	1.4	2012	25.3
2000	0.8	2013	17.7
2005	2.1	2014	4.1

12. ***Indonesian catch at age*** was discussed at length. The 2012/13 and 2013/14 size data indicate a substantially greater proportion of smaller fish than in other years (over 40% of the catch was aged 0-10 in 2012/13, including 14% age 7 and 13% age 8, Figure 2). It was noted that during 2004-2007 an unusually high proportion of small/young fish was also observed in the catch. In that case, it was determined that the smaller fish had been caught by a small number of vessels that fished well south of the spawning ground so that the relevant fish were excluded from the age frequency (CCSBT-ESC/0709/10). In terms of the 2012/13 and 2013/14 data, initial inquiries indicate that the small fish had been reported from catches by a larger number of vessels from different companies. However, it has not been possible to determine whether: i) these small fish were caught on the spawning ground; ii) whether they were mature, or iii) if mature, whether they were spawning. The meeting agreed that this was an important uncertainty, but that it was unlikely that it could be resolved prior to the ESC. It was suggested that the relative proportions of recruits to the NZ and other fisheries be investigated as part of the review of the indicators at the ESC. The OMMP WG reiterated the previous request (ESC2013) to Indonesia to further investigate and report back on this issue.

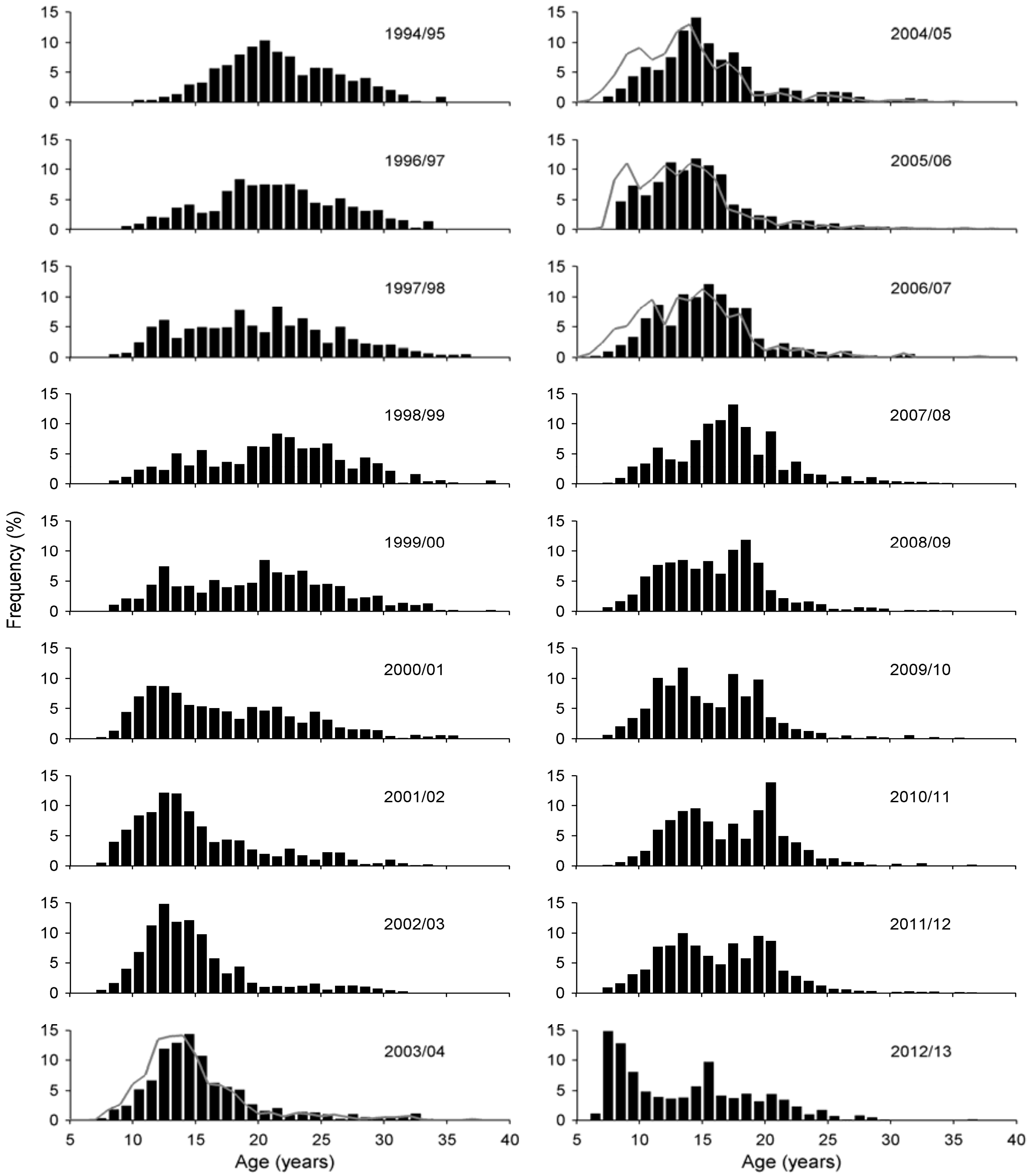


Figure 2. Age frequency of the Indonesian fishery for SBT , by season 1994-2013. The age frequency of SBT thought to be caught south of the spawning ground (Processor A) is shown for the 2004–05 to 2006–07 seasons (grey line) (see Farley et al. 2007, CCSBT-ESC/0709/10).

13. The meeting considered a selectivity change for the last year to allow for the uncertainty over these data. As expected, the effect of the additional flexibility in the selectivity for 2013 was to reduce the size of the recent cohorts recruiting to the spawning biomass and improve the fits to the catch-at-age data. A better fit resulted to both the 8 year olds in 2013 and in 2012. The meeting agreed to adopt this change in the base OM.

1.2 Model diagnostics

14. The preliminary reconditioning results for the OM (OMMP/1406/04) were presented. The fits to the CPUE and Aerial Survey index using the Posterior Predictive Analysis were discussed. It was noted that the difference between the predicted and observed indices for the Aerial Survey were more substantial than for the CPUE and that 5 of the 17 observations were outside the estimated confidence intervals (Figure 8 of OMMP/1406/04). The inclusion of the Aerial Survey index in the Operating Model assumes 0.18 process error added to the observation error from the survey, which results in a realised CV of ~ 0.28. There was concern that the additional process error may not be sufficient to be consistent with the recent observations.
15. The working group recalled that the rationale for the higher CV (0.2), relative to that estimated for the CPUE series (0.13) was implemented due to concerns that the estimated CV for the CPUE was artificially low and the potential for bias, as a fisheries-dependent index. Conversely, the Aerial Survey is a fisheries independent index implemented using a formal survey design, hence is less likely to be biased but is more variable, given sampling constraints and potential sources of process error.
16. The meeting agreed that it was appropriate to maintain the relative weighting of the two series in the OM for these reasons. The average observation error over the aerial survey series (0.458, Table 2), in combination with a revised estimate of process error (τ_{Aerial} =0.22), were used to maintain a total CV of 0.30. Figure 3 shows revised fits to the aerial survey and CPUE data. The meeting agreed to the change in aerial process error (τ_{Aerial} =0.22) in the base OM.

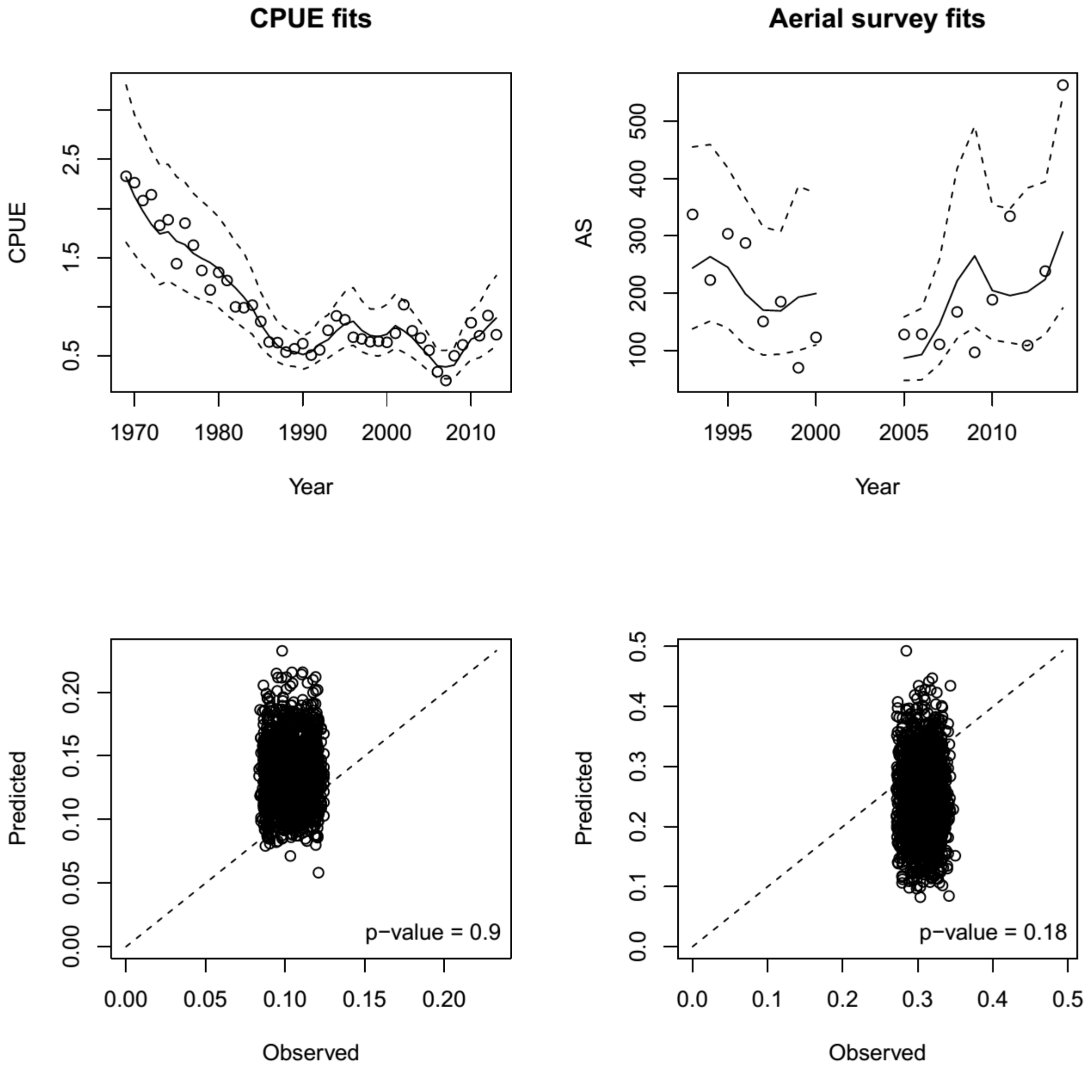


Figure 3. Diagnostics of the aerial survey and fishery CPUE for the base model with the revised τ_{Aerial} =0.22 for the Aerial CV.

Table 2. Example grid-cell fit to observed Aerial Survey time series and the log residual.

	Observed	Predicted	Log Residual
1993	337.625	272.674	0.213659
1994	223.083	288.735	-0.25797
1995	303.864	262.249	0.147286
1996	287.711	216.906	0.282492
1997	150.75	183.755	-0.19798
1998	185.197	180.056	0.028152
1999	69.8241	201.161	-1.05813
2000	122.955	208.987	-0.53045
2001		186.981	
2002		151.171	
2003		110.996	
2004		86.0013	
2005	127.913	84.6011	0.413403
2006	128.422	89.8202	0.357512
2007	110.772	131.476	-0.17135
2008	167.37	196.003	-0.15792
2009	96.7557	234.229	-0.88411
2010	188.614	191.048	-0.01282
2011	334.491	188.502	0.573501
2012	108.697	197.225	-0.59578
2013	238.632	233.268	0.022735
2014	563.533	360.928	0.445547
		Stdev log(Residual)	0.458

17. ***Length Frequency from longline fleets:*** The fits to each of the four longline fleets were reviewed. It was noted that, consistent with previous decisions, a number of years in the LL3 series are heavily down-weighted, or excluded, in the model fitting due to a lack of confidence in the representativeness of the size data or very small catches (i.e., less than 100 t).

18. ***Age Frequency from Surface Fishery:*** The fits to the age frequency from the surface fishery are very good as the model selectivity for this fishery is allowed to change every two years, and the parameters effecting the changes have a high CV. This is to accommodate the catches from the fishery in the fit without introducing any potential bias in the estimates of recruitment through the implementation of the farm anomaly sensitivity.

19. The fits to the close-kin data were presented and included the Posterior Predictive Analysis (Figure 4). Given the low numbers of data points (at the level of aggregation used in the OM) these data were considered to be fitted well by the OM. Given this and the lack of evidence for over-dispersion of the data, the meeting agreed that there was no need to consider alternative formulations of the likelihood for these data at this time (e.g. TOR 3c).

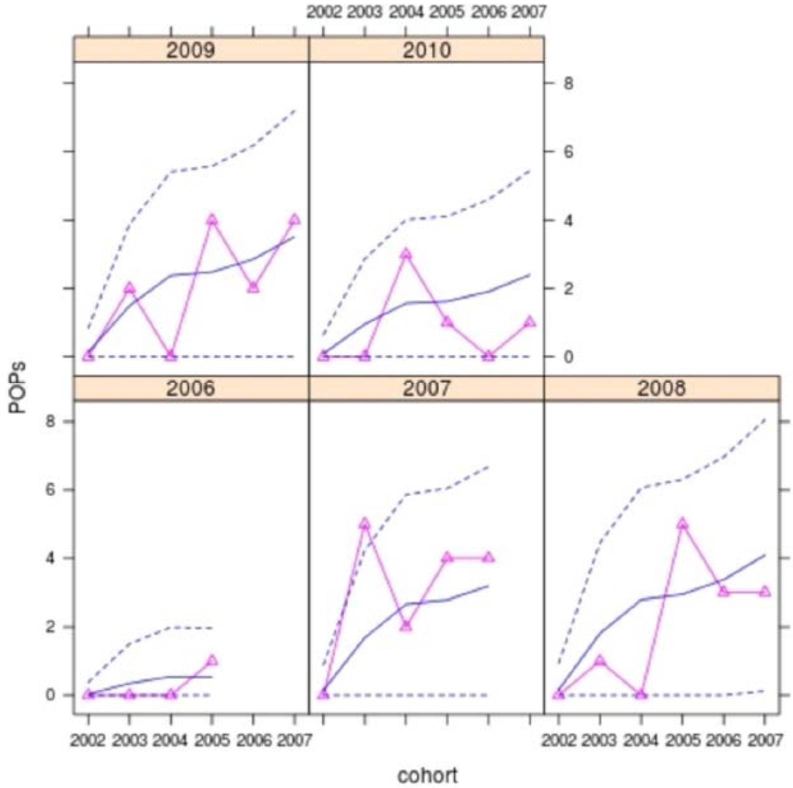


Figure 4. Fits to the close-kin data. Predicted in the reference set of OMs (blue, median and 95% CI) versus observed (magenta triangles) number of POPs for the close-kin data aggregated to the cohort level (i.e. across both adult capture year and age).

1.3 Evaluation of sensitivity to the use of flat Indonesian selectivity.

20. The selectivity of the Indonesian fishery was reviewed in light of previous concerns about dome-shaped selectivity and as part of investigating potential sources of differences between the OM and the close-kin estimates of spawning biomass (independent of the OM), which implicitly assume a flat selectivity function for the Indonesian fishery.

21. The likelihood components for the base OM, profiled over M_{10} (Figure 5) were compared with those obtained when the selectivity of the Indonesian fishery was assumed to be flat for ages 20+ (IS20 sensitivity, Figure 6). Although the total likelihood value was reduced (~5 likelihood points) it was not considered a significant difference, given that the number of parameters was also reduced. The impact of lower M_{10} is to make the selectivity pattern more domed.

22. An evaluation of the M_{10} parameter in 2013 showed that the close kin data did not favour low M_{10} in isolation, but in conjunction with the tag data a lower M_{10} was preferred.

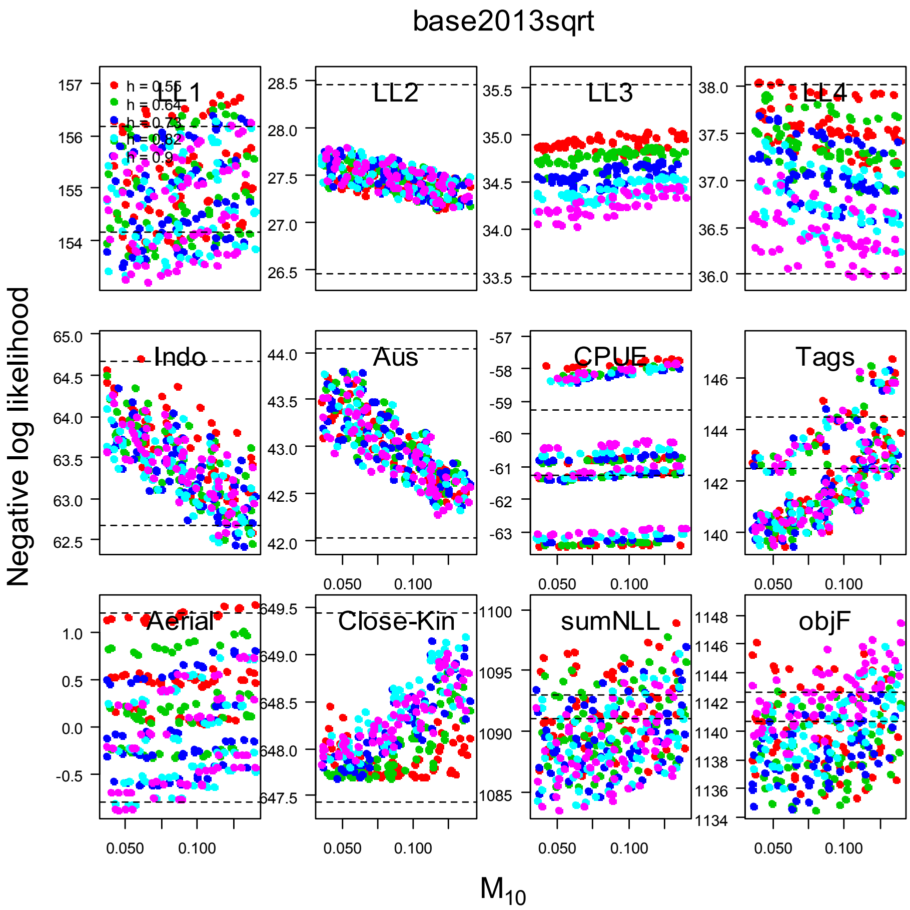


Figure 5. Likelihood profile for the base model (over M_{10}).

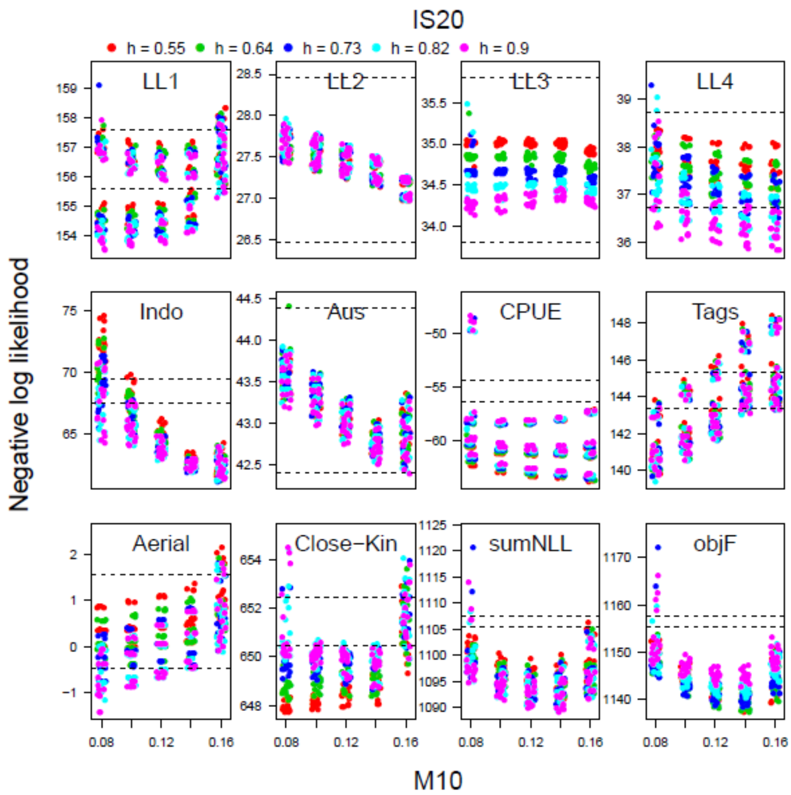


Figure 6. Likelihood profile (over M_{10}) for the sensitivity that uses a flat Indonesian selectivity starting at age 20.

23. The comparisons indicate that there is not a substantial difference, in terms of likelihood, between the two cases; but the OM has a consistent preference for the dome-shaped selectivity. It follows that there is not a substantial inconsistency between the flat selectivity assumed in the independent close-kin analysis and the current OM. Given this, it was agreed that IS20 would be retained as a plausible sensitivity test.

1.4 Evaluation of possible changes in q in 2008

24. From OMMP/1406/04 bubble plots for the Japanese CPUE at age reveals patterns by cohort (Figure 7) noting that OMMP/1406/12 also suggested such patterns. The year effects are seen as diagonal patterns (in reverse) while stronger year classes should appear as vertical patterns. The paper notes:

Area 4: Similar trends, with an apparent mix of potential recruitment and year-effects (catchability) in the 2008 and 2009 CPUE increases. Also, potentially a signal for a stronger 2005 year-class.
Area 5: No apparent change.
Area 6: Data ends in 2006 so better to analyse the New Zealand CPUE which shows a clear year-effect in the 2008 and 2009 data still, as well as a weaker year effect for the 2011-2012 CPUE.
Area 7: Similar trends and a mixture of potential cohort and year effects in recent years with, arguably, better evidence of a stronger 2005 year-class moving through the most recent data.

Area 8: No obvious shift observed from 2011.

Area 9: Continued evidence of the catchability year-effect but also stronger evidence of a larger 2005 year-class than in previous analyses.

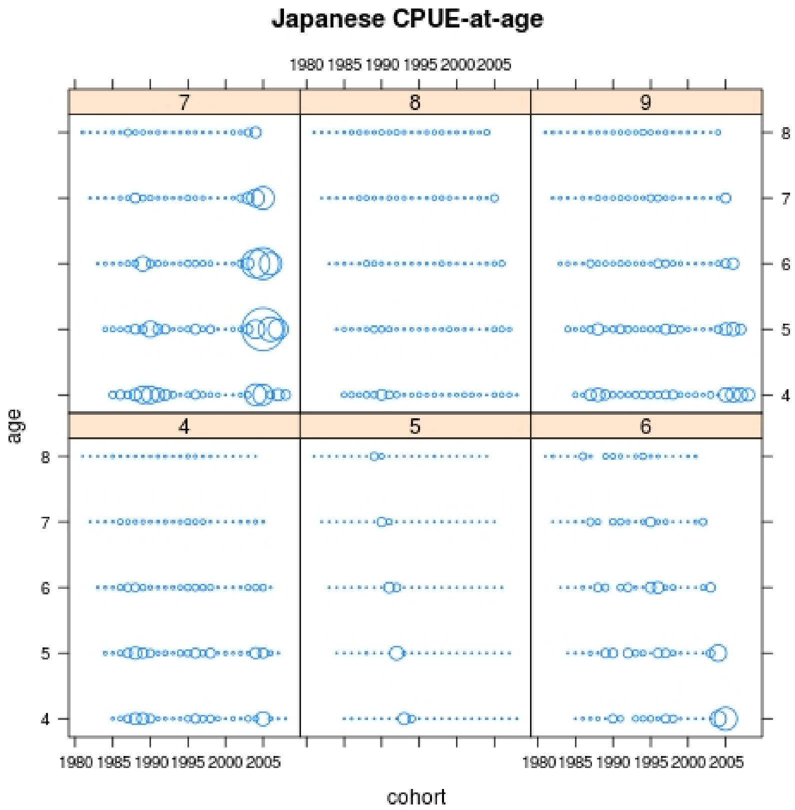
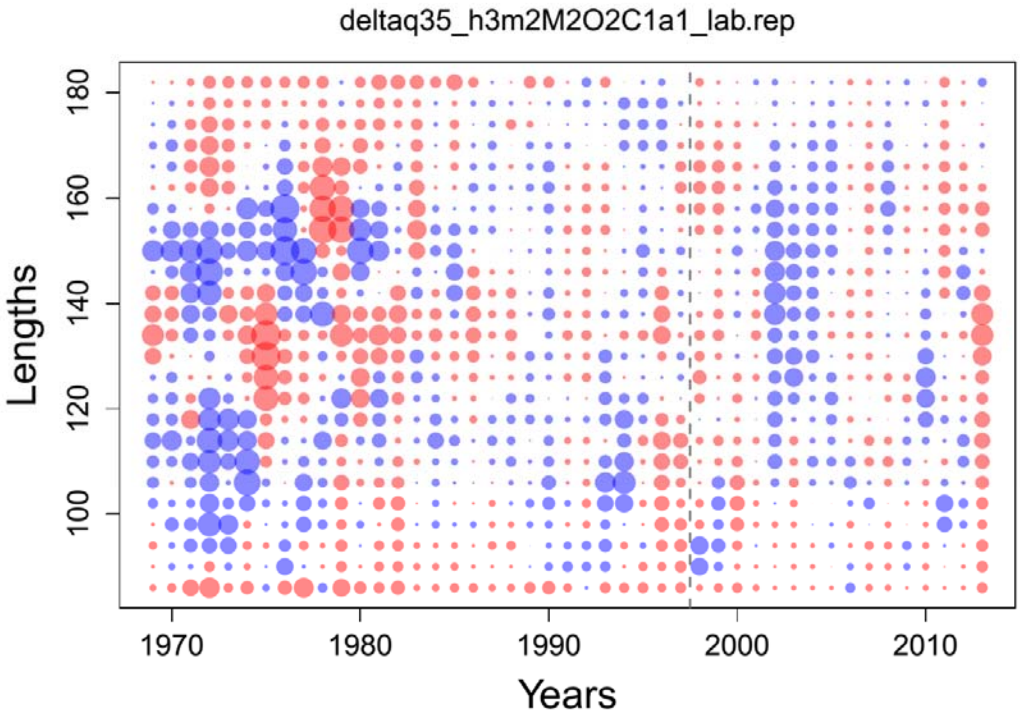


Figure 7. Bubble plot of CPUE by age in the LL1 fishery for an intermediate grid-cell showing the influence of CPUE year-effects (larger bubbles that appear diagonally).

25. Upq2008 residuals from LL1 CPUE by size category were plotted (Figure 8) as Observed-Predicted (negative residuals in red, positive in blue). There appears to be little difference between the upq2008 and the base run for years 2008 and onwards.



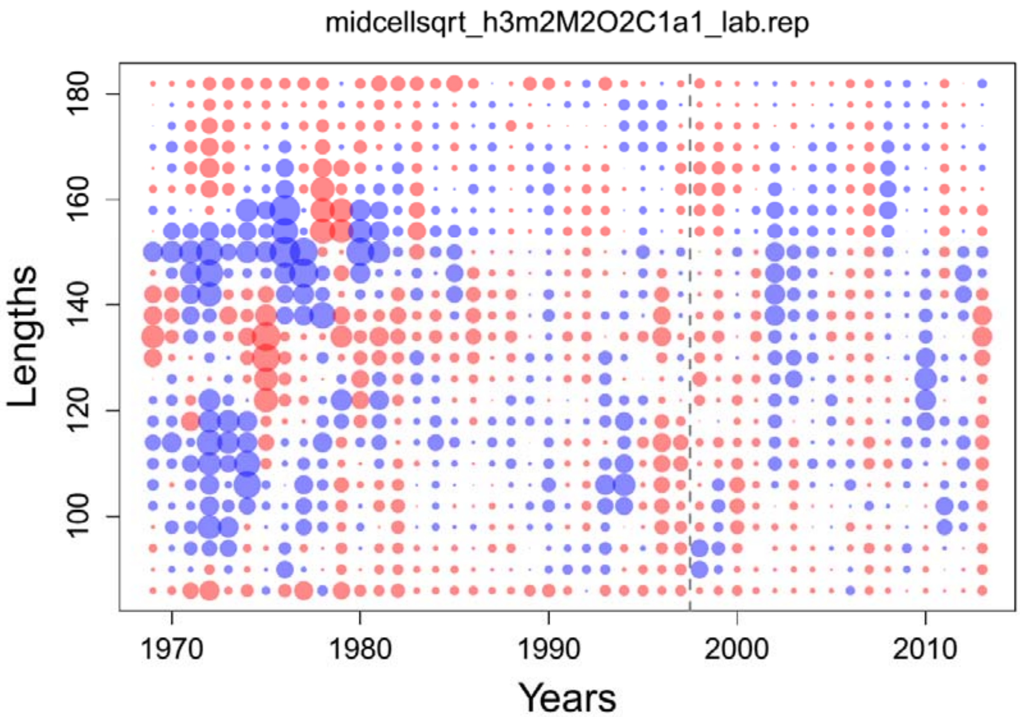


Figure 8. Residual plot of CPUE by size category in the LL1 fishery for an intermediate grid-cell (bottom) and the same cell with a 0.35 increase in log(q) for CPUE in 2008 (top).

26. In the reconditioned OM the value of the increase in log(q) in 2008 was estimated to be 0.25, down from the previous value of 0.35 (Figure 9). The recent catch at age data has confirmed the entry of some stronger cohorts, in particular the 2005 cohort, in this period, which explains some of the CPUE increase. There is also suggestion of a year effect (catchability increase) in areas 4, 6 and 9 in 2008.

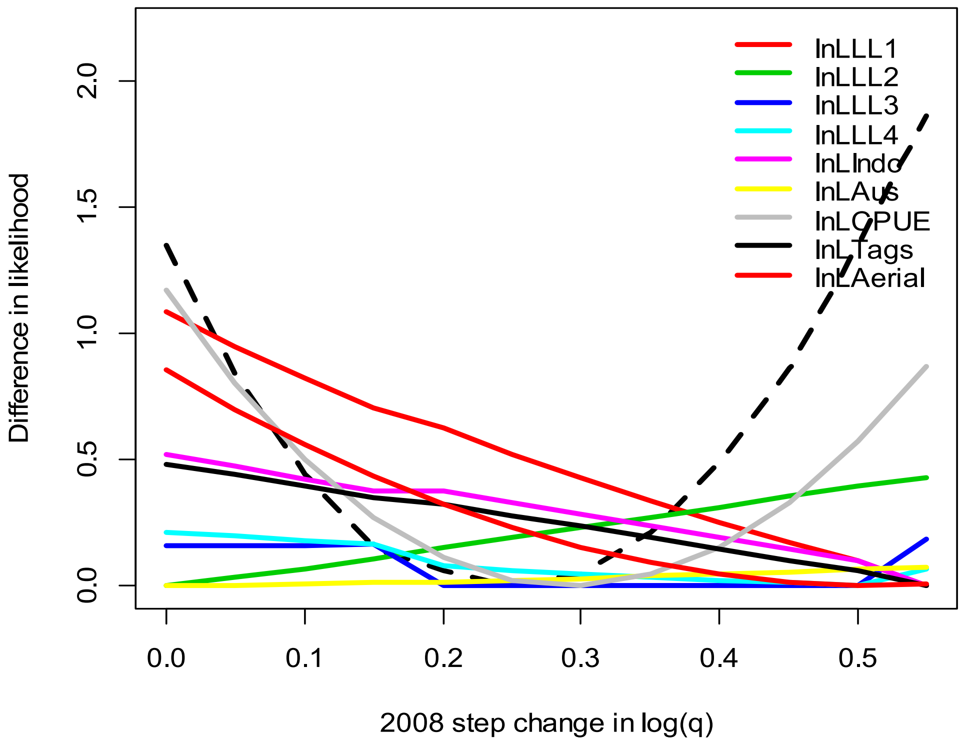


Figure 9. Log-likelihood profile (relative to the minimum value) for each likelihood component over the magnitude of 2008 log(q) step change.

27. A 3-year increase in q (2008-2010 only) was compared to upq2008 (permanent change after 2008). Neither of these runs seemed to improve the fit by much. The meeting agreed to keep the upq2008 option as a sensitivity, using a step-function increase in log(q) of 0.25.

28. OMMP/1406/13 discussed the difference between the base case and reduced base case CPUE standardisation (Figure 1). It was recognised that the CPUE year trends were not parallel to each other by latitude, which resulted in increases in recent years for higher latitude in Area 7 and Area 9 (Figure 10 and Figure 11). It was also noted that there has been few operations in higher latitude (e.g. 45S) in recent years (Figure 12). Averaging CPUE by latitude band and area was recommended. Three options were:

    <u>Leave out data from 45S:</u> To reflect change in fishing behaviour, as there were few data from 45S mainly from Area 9 for the constant-square weighting. Results of this sensitivity were less optimistic for the last four years than the base model (Figure 13).

Combine 45S with 40S data: This gave results equivalent to the first option above. This option avoids leaving out any data.

Add a 3-way year/latitude/area interaction: Combine 40S and 45S data together in this option. This option resulted in a high proportion of empty cells (20.6%) and hence would not be straightforward to implement and could not be completed at the meeting.

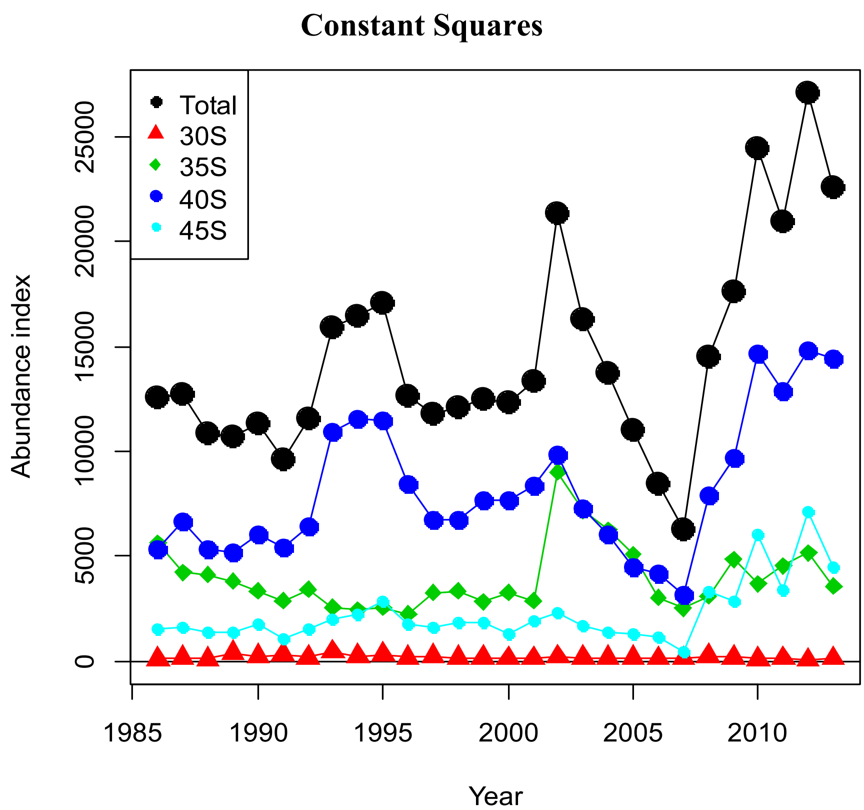


Figure 10. Core vessel CPUE indices for the Constant-Squares weighting by latitude.

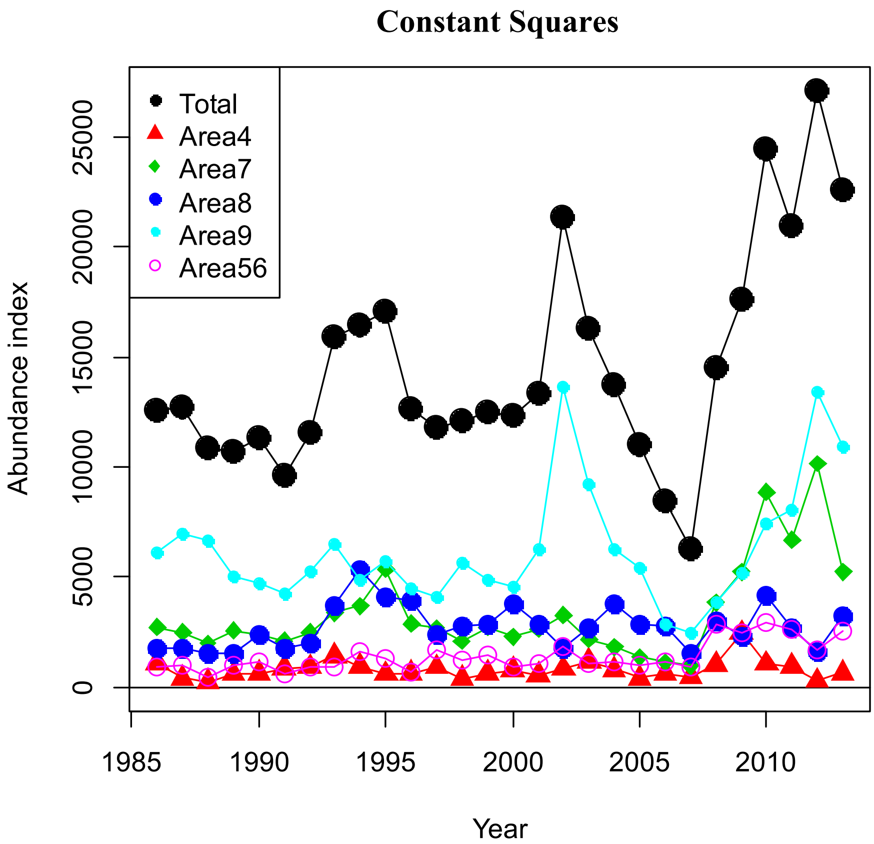


Figure 11. Core vessel CPUE indices for the Constant-Squares weighting by CCSBT Statistical area.

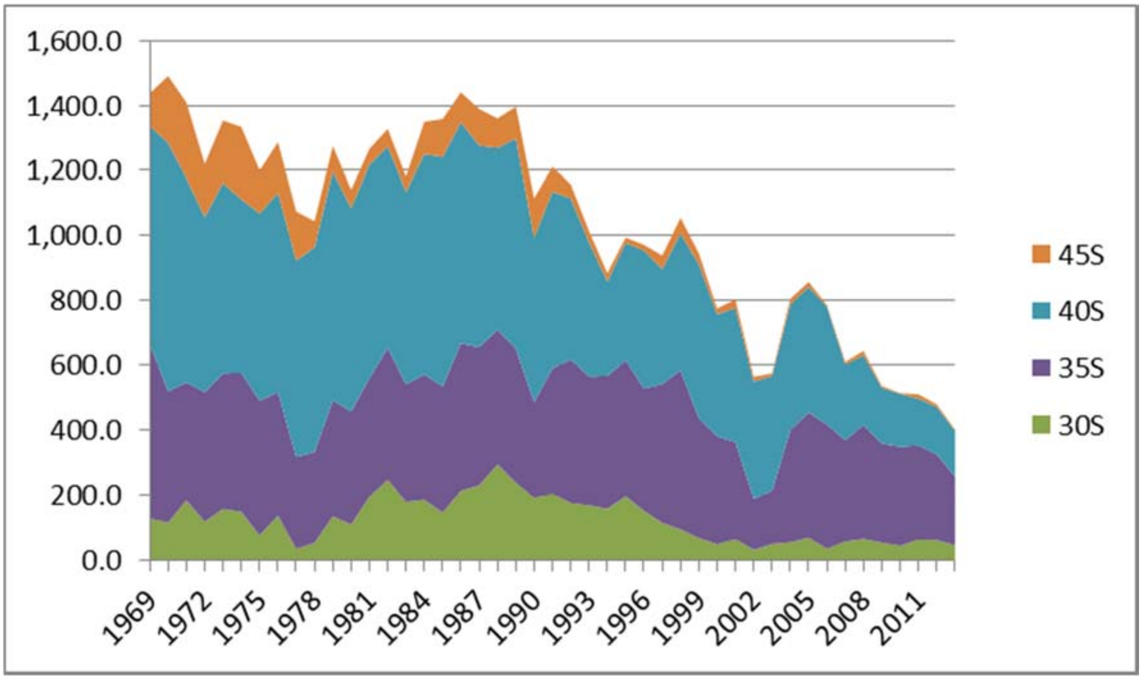


Figure 12. Area weighting factors for Japanese longline summed by latitude.

29. The reduced base model without latitude and area interactions did not change from the previous analysis when the 45S data were either omitted or combined with 40S.

30. The meeting agreed that the base CPUE series should not be changed even though it showed some lack of robustness (described above) to continue to allow for changing distribution of the population and fishery over time. A sensitivity run using the 45S and 40S data combined was suggested as a suitable additional sensitivity in the OM and exploration of alternative approaches to better managing this combination of spatial and temporal interactions in the CPUE series was encouraged.

31. The meeting discussed the possible importance of considering size in the CPUE analyses. As a test of this, mean size of fish in the catch aggregated by area/latitude was examined (also by decadal time step). It was suggested that the ESC may wish to consider a base CPUE model run for 3 separate size ranges of fish. RTMP data are available from 1995 to the present that could be used for this purpose. An equivalent run from 1995 would also be needed for comparison. It was noted that this was not essential for the ESC this year. An additional index using weight instead of numbers was also suggested as another avenue for exploration.

32. John Pope presented a Shepherd-Nicholson model (CPUE webinar paper 5) fitted to CPUE by age, year and area data. The "best" model was:

$$\text{Ln (CPUE)} = YC + A{:}AREA + Y7B + trend{:}AREA + \varepsilon$$

where YC is a year-class factor, A an age factor, AREA an statistical area factor, Y7B a 7 year time block factor and a linear trend acting only on years post 2005, and ε is a normal error term. An alternative model:

$$\text{Ln (CPUE)} = YC + A{:}AREA + Y7B + tt{:}AREA + \varepsilon$$

with tt as a factor of the years post 2005 does not improve fit. This suggests that the 2008 point is part of a general increasing trend (due to reduced F in these years?) and hence the sensitivity run upq2008 (step increase of log(q) in 2008) may not be needed. The linear trend was estimated at 0.04 per year which may match the decrease in F observed over this period (post 2005).

33. The proportions at age data from the comparison of the upq2008 with the base model was used to check this (i.e., see paragraph 25 above).

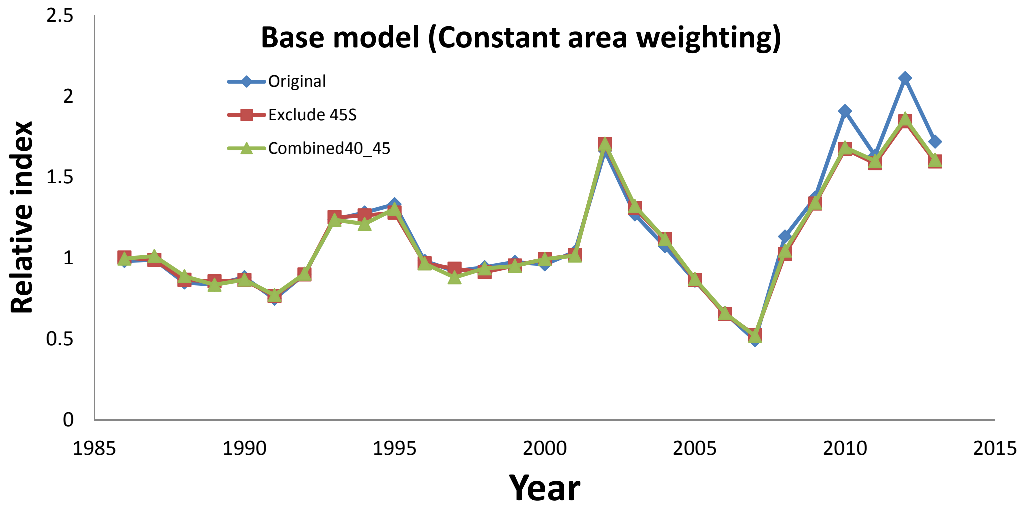


Figure 13. Example results for constant-squares model comparing base CPUE model with those that combine or exclude higher latitude bands.

1.5 Other

34. OMMP/1406/04 shows the recalculation of the over-dispersion coefficient for the 1990s tag data. The revised estimate of the over-dispersion factor for the 1990 tag data is 1.82. This suggests these data are underweighted in the OM fits. The meeting agreed to revise the base case of this parameter from 2.35 used in the 2011 to the updated value of 1.82.

1.6 Incorporation of unaccounted catch mortalities.

35. OMMP/1406/11 was presented with a proposal for an approach to developing scenarios for unaccounted mortalities.

36. The group agreed that it was important that developing the scenarios be systematic, consistent, and defensible from a scientific perspective. They also noted the importance of including all sources of mortality for the accuracy of assessments and the 2017 MP review. It was acknowledged that the OMMP lacked information required to construct the full range of plausible scenarios for unaccounted-for mortalities and that a comprehensive analysis would require additional inputs.

37. The OMMP WG focused their attention on the range of potential sources of unaccounted mortalities, the required types and potential sources of information that could better inform scenarios of them, and strongly encourages the ESC, Compliance Committee and EC to work towards filling the gaps in the information base, that currently limit the OMMP WG's ability to respond to the request from the Commission.

38. The potential sources of unaccounted mortality (defined by the 2013 EC) include:

- Unreported or uncertainty in retained catch by Members, for example:
  - surface fisheries,
  - artisanal catch,
  - non-compliance with existing measures (e.g. catch over-run);

- Mortality from releases and/or discards;
- Recreational fisheries;
- Catches by non-Members;
- Research Mortality Allowance; and
- Any other sources of mortality that the ESC is able to provide advice on (including depredation).

1.6.1 Surface fisheries

39. OMMP/1406/09 was summarised including the methods and results previously used for estimating the potential bias in the reported catch in the Australian surface fishery. Three methods have been used:

- Mixture analyses;
- Cohort slicing; and
- Growth method.

40. The growth method was used to derive estimates of the potential bias for all years from 2001 to 2013. The paper suggested an excess over the reported catch averaging 34.5%. Mixture analyses were available for 2007-2009 and the cohort slicing from 2007-2010.

41. The meeting focussed discussion on the results presented in Table 3, paper OMMP/1406/09 as a basis for better understanding the information, assumptions and calculations used in this method. A spreadsheet was assembled that included all the calculations and sources of information explicitly. This was presented to the working group to better understand how the calculations were made.

42. The key input to this method is the rate of growth of tuna in farm cages. The assumptions used in the paper were based on growth rates and estimates of growth increments from fish recovered in the farm cages as part of the SRP tagging program (ESC/0909/31). The length weight relationship for the 141 tagged fish at release was taken from Robins (1963), while the L-W relationship for the tagged fish at harvest from the farms was based on a large sample of fish (over 4000) at harvest measured in July 2007 when these fish were killed (CCSBT-ESC/1208/30). The accuracy of estimates of the growth rate of fish in farms depends on the applicability of these two L-W relationships to the 141 fish.

43. The meeting discussed the available data for the growth method and listed the data sources and assumptions of the method for further investigation (Table A5.1, **Attachment 5**).

44. On the basis of this discussion and the results presented in paper OMMP/1406/09, some members considered that there was indication that the potential bias in the surface fishery was larger than 20% as included in the current sensitivity analysis. Others were concerned that this conclusion depended heavily on the potential growth rates achieved through farming and also the representativeness of the sample (n=141) of tagged fish from which the growth increment (in weight) used in the analysis was estimated and whether the L-W relationship specified in Robins (1963), used to convert the length of these fish at tagging, was representative of these fish. In particular, some were concerned that the potential bias estimated using this method could simply be a reflection of the

uncertainty in the L-W relationship for the subset of 141 fish at tagging. Published growth rates achieved in tuna farming situations were discussed and more information will be sought for the ESC.

45. The results of the previous work (CCSBT\ESC/1208/30) using mixture analysis and cohort slicing to estimate the abundance of age classes from data on fish length in the market were reviewed. The meeting noted that these analyses indicate clear modes in 2007 to 2009 but not in some months in 2010. In those that clear modes are apparent, they indicate a larger proportion of older fish in the surface fishery, and a smaller proportion of younger fish than is reported.

46. A number of issues were raised that could mean these results are not representative of the catch at age from the surface fishery, including the potential for selection bias in the sub-sample of lengths from the market; the interaction between time of year when the fish are harvested, the size at harvest and the form of processing/sale (i.e. fresh-frozen).

47. It was suggested that the mixture analysis was the best method of the three presented if the length frequency data of fish harvested from farms is an accurate representation of harvested fish on an annual basis. It has been prepared for data from 2007-09, but it was noted that another 3 years of data (2011-13) are now available for further analyses with this method. Many of the issues with the growth method described above are not a problem with the mixture method assuming the length frequency data are representative.

48. The meeting discussed the use of CDS data, for the purpose of these analyses. The CDS data contain length measurements from all fish and were potentially of value from all fleets (e.g. providing length frequency where observer coverage was low or absent). It was noted that the ESC does not have access to these data, which would be very useful for stock assessment purposes. The meeting agreed to request access to CDS data for all fleets via the chair of the SC and the Commission.

49. SRP tagging returns: It was noted that the age structure of the returns and associated estimates of age-specific fishing mortality from the SRP tagging program may also provide information on the potential for bias in the age-structure of the surface fishery. ESC/0709/19 and ESC/0909/19 were reviewed and the age-specific fishing mortalities compared with those estimated by an intermediate grid cell in the OM (which includes a shift in the age composition resulting in a 20% adjustment in weight). It was noted that the age classes covered by the tagging, with the exception of age 2, are also selected to the longline fisheries (i.e. 3-5 year olds), and therefore the effect of the overall fishing mortalities from all fleets had to be considered. A suggested alternative analysis was to calculate the expected number of tag returns by age and fishery, using the parameters estimated by the OM, and compare the resulting age composition of predicted tags with the estimated age composition of the surface catch.

1.6.2 Artisanal catch

50. The catches reported from Indonesia have been updated by the Secretariat since the Commission meeting. The updated data were included in the data exchange and used in the conditioning of the OM.

1.6.3 Mortality from releases and/or discards

51. OMMP/1406/08 summarised the data available on SBT released in the longline fisheries since 2006. In this year Japan implemented IQs in the fishery and it appears that the fishery began high-grading of catches by releasing lower-value fish. The paper presented information from the RTMP on releases on three size classes as well as from the Scientific Observer Programme. The mortality of released fish was taken to be 9% as determined by pop-up tagging (ESC/1309/34).

52. Ilona Stobutzki volunteered to circulate a list of publications related to bias in estimates of post-release mortalities from tagging data.

53. The meeting agreed that the critical information on releases/discards were the numbers or weight of released/discarded catch, status of fish on capture (vigorous/sluggish/dead), size of fish and mortality rates. A table was designed to capture the estimation of the discard mortality based on 2 size classes (less than or greater than approximately 112 cm), and 2 states of capture (dead/sluggish or vigorous). The meeting agreed that sensitivities would be based on two scenarios corresponding to two levels of mortality: 9% (based on the tag experiment) and 100% (most extreme value). Members were requested to provide estimates for each category based on available data from their fisheries. It was also suggested that in future Observers should be asked to record the state of fish retrieved from longlines to improve estimates of mortality.

1.6.4 Recreational catch

54. Recreational catch estimates from recent surveys of Victoria and Tasmania were presented. The meeting discussed the variation from year to year in recreational catches and the likelihood that catch was not only determined by abundance but also by availability of the fish to the fishers in any year (inshore/offshore) and that the combination of these (and other factors) result in substantial inter-annual variation in catch and effort. The meeting agreed on a scenario for recreational catches (**Attachment 5**). The design of a survey for all of Australian recreational catches of SBT will be completed in 2015.

55. The New Zealand recreational catch of SBT is very small (a few fish per year), but no information is available from South Africa. It is unknown if there are other recreational fisheries. The meeting agreed to base recreational catch scenarios at this time, only on estimates of Australian recreational catch, given that the New Zealand recreational catch is reported in the data exchange and that there is a lack of information from other areas.

1.6.5 Catches by non-Members

56. There is no information available on SBT catch by non-Members. Effort from the WCPFC fleet has been examined for distribution of effort relative to SBT catches by Members. There appears to have been some movement of effort further south in recent years which suggests SBT bycatch may have increased.

57. In the absence of any other data, the meeting agreed that each Member should evaluate the bycatch rate of their own longline fleets in the WCPFC and IOTC fishing zones to determine the possible bycatch rate of SBT for unobserved (non-Member) fleets.

1.6.6 Implementation of unaccounted mortalities in the conditioning model

58. Paper OMMP/1406/05 was briefly presented. The paper discusses the issues for technical implementation of unaccounted mortality scenarios in the conditioning model and provides an example scenario and results to demonstrate the types of impacts that may be considered for reporting on at the ESC. Various alternatives for measures of impact were discussed during the meeting and will be further developed intersessionally.

59. Paper OMMP/1406/07 reports sensitivity to unaccounted catch mortality, using three scenarios of extra LL1 catch from 2006 onwards (increases of 1%, 5%, and 10%) in order to examine the impact of recent UAM (from discards and recreational fishing mortality). The conclusion was that past unaccounted catch mortality would have a low impact on estimates of recent stock status, if the amounts of mortality were in the range of 1-10% of the LL1 catch.

1.7 Stock status

60. A presentation of the OM using the base grid was used to evaluate stock status. The lowest M_{10} value had a relatively high sampling rate, compared with the OM in 2013. Figures 17 and 18 of OMMP/1406/04 show preference for each data source for M_{10}, while Figures 13-16 show similar plots for both steepness and M_0. Current depletion for B10+ was 7% (6-9% range), and for the new definition of SSB (see ESC2013) 9% median (range 8-12%). These results do not take into account decisions to modify the OM made during this meeting.

Agenda Item 2. Comparability of OM results with the independent close-kin assessment.

2.1 Size of SSB and survival rates for similar age ranges

61. In paper OMMP/1406/04, estimates of B10+ and total mortality from the stand-alone close-kin assessment model are compared with the updated OM (which includes the close-kin data). The stand-alone close kin assessment model suggests a higher biomass (Figure 14) declining under a higher mortality rate over the same time period (2002-2010) while the OM suggests much lower mortality (Figure 15). A sensitivity run giving very high weight to the close kin data was suggested to evaluate the impact of other data sources in the base OM. This sensitivity could not be completed during the meeting.

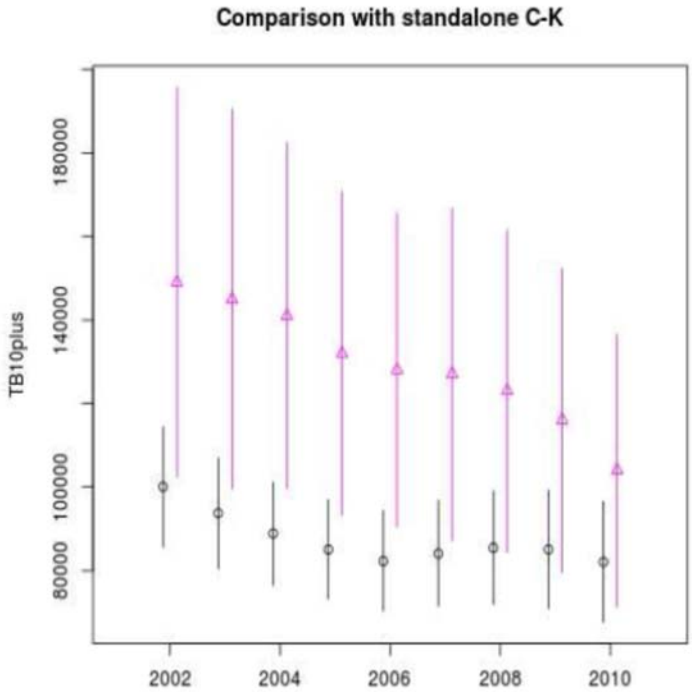


Figure 14. Comparison of biomass of animals age 10 and over for the stand-alone close-kin (magenta, median and 95%iles) and the OM (black, median and 95%iles), From OMMP/1406/04.

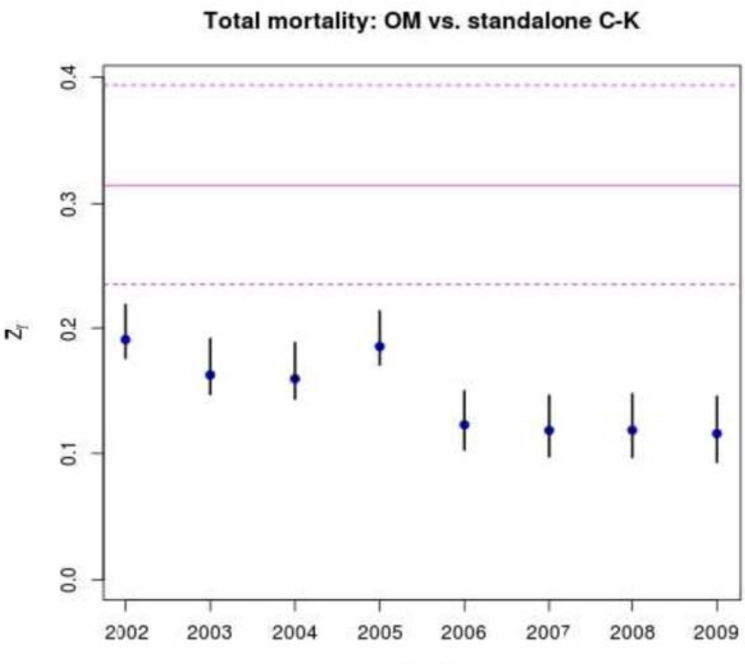


Figure 15. Comparison of total mortality age 8 and over for the stand-alone close-kin (magenta, median and 95%iles) and the OM (black, median and 95%iles). OMMP/1406/04.

Agenda Item 3. Process for evaluating exceptional circumstances

62. Paper OMMP/1406/05 was presented and provides an overview of the meta-rules and process for consideration of exceptional circumstances. Exceptional circumstances will be considered as part of the regular review of fisheries indicators and inputs data series to the MP at ESC2014.

Agenda Item 4. Projection results

4.1 Impact of unaccounted mortalities

63. Paper OMMP/1406/06 was briefly presented. The paper describes the technical changes in the projections code to allow for unaccounted mortality scenarios to be evaluated. The paper also provides preliminary results for an unaccounted mortality scenario to demonstrate the types of measures of impacts on projections and the SBT rebuilding plan that may be considered.

4.2 Other

64. Projections from the base grid presented in papers OMMP/1406/04 and OMMP/1406/07 were reviewed. The impact of the last data points (CPUE and aerial survey) makes the projections much more optimistic than last year. The strong recent recruitment estimate (2012) driven by the high survey index appears to have a similar impact on all the grid options and largely determines the projection trajectory.

65. The assessment results obtained without the 2013 data inputs (OMMP/1406/07) were compared to the results obtained with the inclusion of the latest CPUE and aerial survey data points. A strong 2012 cohort was estimated in the assessment updated with the new data leading to more optimistic projections.

66. Concerns were expressed that the use of point estimates of these recent strong year classes in projections did not capture the uncertainty adequately. Alternative approaches for incorporating within-cell uncertainty (i.e., estimation error) for model projections were evaluated using the covariance estimates from the conditioned model. However, due to model conditioning issues early in the week, the ability to evaluate this was only resolved towards the end of the workshop. The meeting agreed to discuss intersessionally how best to take it forward.

67. Because future recruitment deviations are assumed to be correlated with those estimated in conditioning, the very high estimate of recruitment in 2012, based on a single, highly uncertain datum, propagates forward with high influence (Figure 16). The impact of removing the autocorrelation between past and future recruitment deviations was found to be substantial (Figure 17). The meeting agreed to modify the base case to unlink future recruitment deviations from recent estimates, and to conduct a sensitivity in which the autocorrelation was maintained.

68. In addition, the meeting agreed to conduct a sensitivity excluding the last year's aerial survey data point. For continuity reasons, the meeting agreed to a run that

used an objective-function weighting on steepness (instead of uniform weights as assumed in the base model.

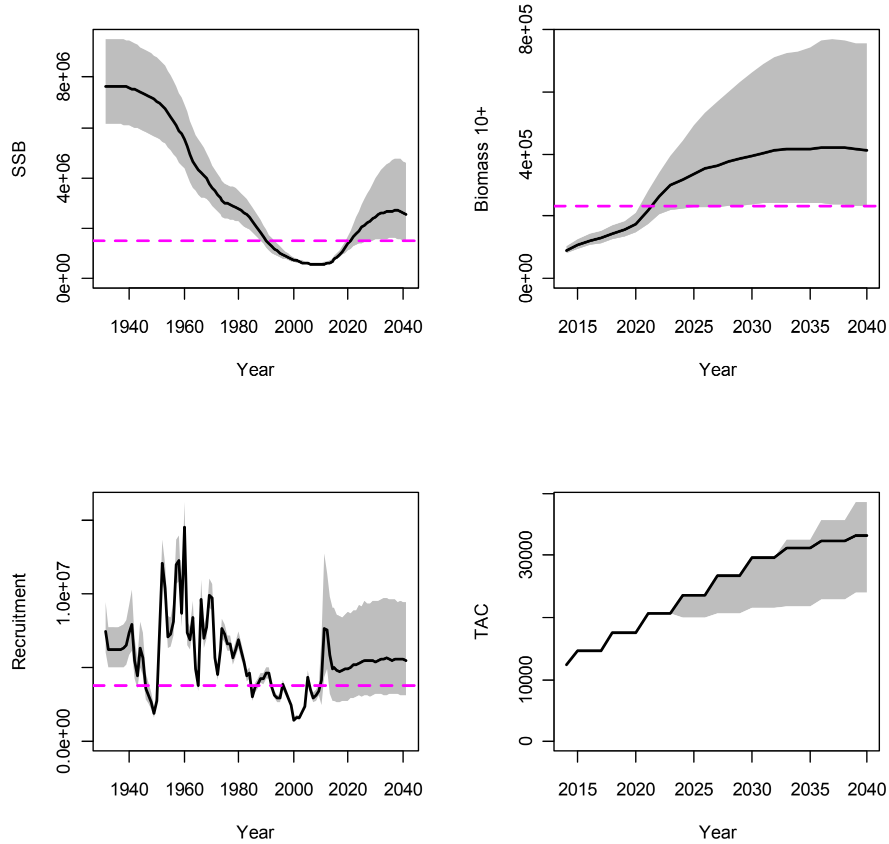


Figure 16. Projections of the base OM with autocorrelation linking the recent high estimate of recruitment deviations with the future projected recruitments. Projections use the MP to set TACs. SSB (new definition adopted in the light of results the close-kin analyses), Biomass 10+ (definition used in 2011), Recruitment and TAC. In each plot the black line is the median of the simulations, grey area is 80th percentile, and the pink dashed line is 0.2 SSB(0) in the SSB plot, 0.2 median B10+(0) in the Biomass10+ plot, and 0.5 median R(0) in the recruitment plot. The blue vertical line is at year 2013.

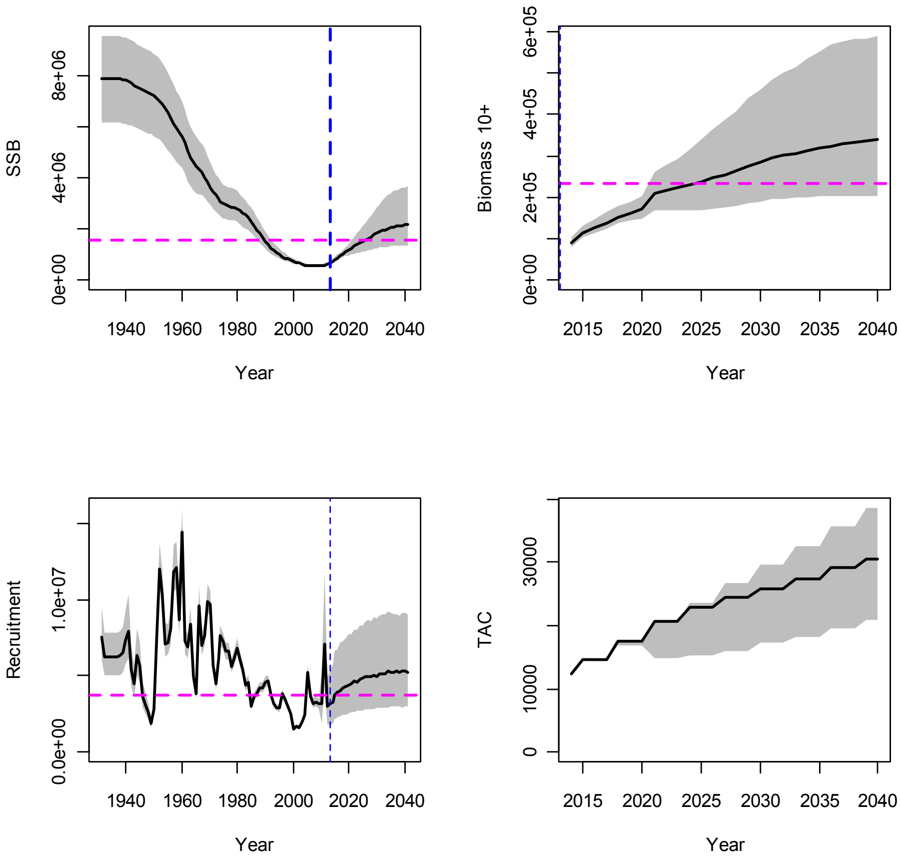


Figure 17. Projections of the base OM with future projected recruitment unlinked with recent historical estimates. Projections use the MP to set TACs. SSB (new definition adopted in the light of results from the close-kin analyses), Biomass 10+ (definition used in 2011), Recruitment and TAC. In each plot the black line is the median of the simulations, grey area is 80th percentile, and the pink dashed line is 0.2 SSB(0) in the SSB plot, 0.2 median B10+(0) in the Biomass10+ plot, and 0.5 median R(0) in the recruitment plot. The blue vertical line is at year 2013.

Agenda Item 5. Reconsideration of reference set and sensitivity runs.

5.1 Definition of final grid structure.

69. The following changes to the base model (the OM) were agreed at OMMP5:

- Free up Indonesian selectivity for 2013 (in addition to 2012) to accommodate the observed sharp increase in smaller/younger fish in the catch (age 7+), which may reflect changes in fleet behaviour (e.g. fishing outside spawning grounds);
- Change tag over-dispersion parameter to 1.82 (instead of 2.35);
- Change process error for the aerial survey from 0.18 to 0.22; and
- Projected recruitment deviates are unlinked to historical estimates from the conditioned model (autocorrelation continues in the projections).

Table 3 specifies the axes for the reference grid agreed at OMMP5.

Table 3. Specification of the axes of reference set grid.

	Levels	Cumul N	Values	Prior	Simulation Weights
Steepness (*h*)	5	5	0.55 0.64 0.73 0.82 0.9	Uniform	Prior
M_1	4	20	0.35 0.40 0.45 0.50	Uniform	Objective function
M_{10}	4	80	0.050 0.075 0.1 0.125	Uniform	Objective function
Omega	1	80	1	NA	NA
CPUE series	2	160	w.5 w.8	Uniform	Prior
q age-range	2	320	4-18 8-12	0.67, 0.33	Prior
Sample Size	1	320	Sqrt	NA	NA

5.2 Definition of sensitivity runs.

70. Sensitivity runs and priorities are specified in Table 4.

Table 4. Sensitivity runs to be conducted for assessment purposes.

	Sensitivity Run	Description	Source	Priority
1	Added catch	Unaccounted catch mortality (see paragraph 72 below)	OMMP5	High
2	SFOC20	Continue 20% overcatch scenario from Australian fishery surface fishery (SF) as if the stereo video system was not implemented	ESC 2013	High
3	SFOC40	Apply 40% overcatch scenario from the Australian fishery (historical and projected)	OMMP5	High
4	SFOC00	No historical nor future additional catch in surface fishery	OMMP5	High
5	S00CPUE	Overcatch had no impact on LL1 CPUE	ESC 2009	High
6	S50CPUE	50% of LL1 overcatch associated with reported effort	ESC 2009	High
7	IndSelFlat20	Indonesian selectivity flat from age 20+	ESC 2013	Med
8	HighAerialCV	In conditioning (set process CV to 0.4)	OMMP5	Low
9	No2014Aerial	Remove the 2014 aerial survey data point from conditioning (keep for MP)	OMMP5	High
10	Upq2008	CPUE q increased by 25% (permanent from 2008)	OMMP5	Med
11	Omega75	A power function for the relationship between biomass and CPUE with power = 0.75 (compare residuals with base)	ESC 2009	Med
12	HighLatAggCPUE	Combine Lat 45S and 40S in the GLM	OMMP5	High
13	NoInteractCPUE	Use CPUE trend from GLM without interactions year x area & year x latitude	OMMP5	High
14	UpWtCK	To understand the influence of the close-kin data	OMMP5	Low
15	TagFMixing	Increases the fishing mortality of tagged SBT by 50% relative to the F applied to the whole population. Account for incomplete mixing of the tagged fish (explore impact on M)	ESC 2009	Med
16	TrollSurv	Includes the piston-line troll survey index	ESC 2009	Med
17	SteepnessWts	For continuity with previous assessment, weight *h* by objective function	OMMP5	High
18	CorrHistRecDevs	Projected recruitment deviates are correlated to historical estimates from the conditioned model	OMMP5	Low
19	Start1980	Evaluate initial conditions by ignoring data prior to 1980 including the catches	OMMP5	Low

71. In terms of implementing the “added-catch” scenario (Table 4) in the model, as described in **Attachment 5**, the meeting agreed to assign the unaccounted mortalities to the fisheries to whose size distributions there is the closest match (fisheries 1 and 6 in the conditioning model). It should be understood that these fisheries may not be the source of the unaccounted mortality; rather this is an expedient way to implement the sensitivity.

72. Given the lack of information and uncertainty on sources of unaccounted catch mortalities (**Attachment 5**), the “added-catch” scenarios will be implemented as unaccounted catch increasing from 0 t in 1990 to 1,000 t in 2013, both for smaller fish (assigned to fishery 6) and larger fish (assigned to fishery 1). For future projections, the “added-catch” sensitivity will assume that the additional catch remains at the same proportion of the TAC as in 2013; in addition, the surface fishery will be increased by 20% as in the SCFO20 scenario. The discussion

noted that this may not necessarily be the case but it was the most expedient approach to test the sensitivity.

Agenda Item 6. Code refinements and version control system

73. Code changes were developed intersessionally. The meeting appreciated efforts toward developing a robust method to track changes in the code and data inputs.

Agenda Item 7. Workplan and timetable

7.1 Update code of OM and associated graphics files if needed

74. Graphics and code were updated and will be placed in the repository.

7.2 Identify issues to be discussed at ESC

75. The following specific issues were identified for discussion at the ESC, in addition to the analysis of indicators and assessment results using the base reference set and sensitivity tests:
    i. Effect of different factors in the standardisation of the aerial survey indices.
    ii. Incorporation of within-cell uncertainty in assessment and projection results.
    iii. Possible changes in productivity and effects of assumptions about initial conditions on reference points.
    iv. Analysis of size/age composition of farmed fish to estimate potential biases in the age composition of the surface catch.
    v. Analysis of age composition of tag recoveries and comparison with reported age composition of surface catches.
    vi. Additional information on growth rates of farmed SBT and related species.
    vii. Each Member to evaluate their Observer data for information on discard/release mortality, including the life status of fish at the time of hauling on pelagic longlines to improve estimation of post-release survival.
    viii. Analysis of the overlap in spatial distribution of non-member pelagic longline fleets (e.g. in the WCPFC and IOTC fishing zones) in areas and months where SBT may be a bycatch. Estimates of bycatch rates of member's longline fleets in these areas and times to develop potential scenarios.
    ix. Further consideration of scenarios for sources of unaccounted mortalities as information becomes available.

Adoption of report

76. The meeting adopted the report.

Close of meeting

77. The meeting closed at 19:53, 27 June 2014.

List of Attachments

Attachment

1	List of Participants
2	Agenda
3	List of Documents
4	Summary of April CPUE Web meeting
5	Developing scenarios for unaccounted catch mortality

Attachment 1

List of Participants
Fifth Operating Model and Management Procedure Technical Meeting

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Attachment 2

Fifth Operating Model and Management Procedure Technical Meeting
24-27 June 2014
Seattle, Washington, U.S.A.
<u>Agenda</u>

Terms of Reference

The OMMP5 technical meeting will focus on updating the operating model with new data so as to conduct an in-depth stock assessment at SC19. The following terms of reference for the OMMP5 were agreed by the ESC in 2013:

1. Complete specification of OM structure and sensitivity runs. The main pending issues are:
    a. *The sensitivity for flat Indonesian selectivity*
    b. *Specify the upq2008 by estimating the change in q using the OM and examining the CPUE by age and year using bubble plots or other approach (e.g., the Shepherd Nicholson method)*
    c. *Incorporation of unaccounted catch mortality*
    d. *Others as deemed appropriate during the meeting*
2. Further consider comparability of OM results with the independent close-kin assessment.
    a. *Size of SSB*
    b. *Survival rates for similar age ranges*
3. Refine OM where possible; e.g.,
    a. *Continue to evaluate OM residuals and effective sample sizes*
    b. *Better numerical scaling, an evaluation of which parameters are causing the Hessian to be non-positive definite*
    c. *Add the capability to use alternative likelihood components for the CK data (e.g., the Beta-Binomial)*
    d. *Evaluate retrospective patterns*
    e. *Check MSY calculations and reference points*
    f. *Refine use of version control for all code (MP, OM and R scripts)*
    g. *Evaluate how to incorporate within-cell uncertainty in OM grid*
    h. *Evaluate sensitivity to exclusion of the assumed linear increment in q over time*
4. Further refine diagnostic outputs
    a. *Fits to size compositions*
    b. *CPUE residuals*
5. Evaluate productivity shifts; e.g.,
    a. *Recruits per spawner over time*
    b. *Alternative initial conditions*

In addition, the EC requested the ESC to:

(i) Conduct sensitivity analysis around all sources of unaccounted catch mortality and incorporate this information in its advice on the existence of exceptional circumstances and approach to follow in accordance with the metarule process.

(ii) Provide preliminary advice on the impact of any unaccounted catch mortalities on the stock assessment projections and the possible Management Procedure recommendation beyond the 2015-17 quota block.

The sources of mortality should include:

- Unreported or uncertainty in retained catch by Members, for example surface fisheries, artisanal catch, non-compliance with existing measures (e.g. catch over-run);
- Mortality from releases and/or discards;
- Recreational fisheries;
- Catches by non-Members;
- Research Mortality Allowance; and
- Any other sources of mortality that the ESC is able to provide advice on (including depredation).

Adopted Agenda

1. Evaluation of OM results using updated data and estimates of unaccounted catch mortality.

1.1 Incorporation of new data

1.2 Model diagnostics

1.3 Evaluation of sensitivity to the use of flat Indonesian selectivity.

1.4 Evaluation of possible changes in *q* in 2008

1.5 Other Overdispersion coefficient for tag data

1.6 Incorporation of unaccounted catch mortalities

2. Comparability of OM results with the independent close-kin assessment.

4.1. Size of SSB

4.2. Survival rates for similar age ranges

3. Process for evaluating exceptional circumstances

4. Projection results

2.1. Impact of unaccounted mortalities

2.2. Other?

5. Reconsideration of reference set and sensitivity runs.

5.1 Definition of final grid structure

5.2 Definition of sensitivity runs

6. Code refinements and version control system

7. Workplan and timetable

7.1 Update code of OM and associated graphics files if needed

7.2 Identify issues to be discussed at ESC

Attachment 3

List of documents

(CCSBT- OMMP/1406/)

1. Provisional Agenda
2. Draft List of Participants
3. Draft List of Documents
4. (Australia) Preliminary reconditioning of the SBT OM with updated data in 2014. (Preece, Davies, Hillary) (OMMP Agenda Item 1.1)
5. (Australia) Preliminary consideration of methods for the sensitivity analysis of alternative catch series in stock assessments. (Preece, Davies, Hillary) (OMMP Agenda Item 1.1)
6. (Australia) Preliminary consideration of methods for the sensitivity analysis of alternative catch series in projections (Rev). (Preece, Davies, Hillary) (OMMP Agenda Item 2.1)
7. (Japan) Examination of the southern bluefin tuna (SBT) operating model and preliminary projections for the 2014 assessment. Sakai O. (OMMP Agenda Item 1, 2, 3, 4)
8. (Japan) Mortality estimation for southern Bluefin tuna released and discarded from Japanese longline fishery. Itoh T. (OMMP Agenda Item 1.2)
9. (Japan) Unaccounted catch mortality in Australian SBT farming fishery between 2001 and 2013 estimated from information of TIS and CDS (Rev). Itoh T. (OMMP Agenda Item 1.2)
10. (New Zealand) Estimating unaccounted catch mortality in southern bluefin tuna fisheries (OMMP Agenda Item 1.2)
11. (Japan) Examining the reasonability of “upq2008” sensitivity scenario using historical fluctuation of nominal Japanese CPUE by age/ Sakai O. (OMMP Agenda item 1.5)
12. (Japan) Update of the core vessel data and CPUE for southern bluefin tuna in 2014. Itoh T and Takahashi N. (OMMP Agenda Item 1.1)

(CCSBT- OMMP/1406/ Rep)

1. Report of the Twentieth Annual Meeting of the Commission (October 2013)
2. Report of the Eighteenth Meeting of the Scientific Committee (September 2013)
3. Report of the Fourth Operating Model and Management Procedure Technical Meeting (July 2013)
4. Report of the Nineteenth Annual Meeting of the Commission (October 2012)
5. Report of the Seventeenth Meeting of the Scientific Committee (August 2012)
6. Report of the Sixteenth Meeting of the Scientific Committee (July 2011)
7. Report of the Third Operating Model and Management Procedure Technical Meeting (June 2010)

Attachment 4

Summary of April CPUE Web Meeting

The web meeting considered two papers from Japan about the quality of the Base CPUE series. The first examined the effect of the correction of three minor errors. None of these had significant effects on the Base CPUE Series (Figure A4.1). The second was the annual review of changes in the intensity and fishing patterns of the Japanese LL1 fishery. The main effect was a reduction in the number of vessel trips, hooks deployed and SBT numbers caught (Figure A4.2). It was concluded that while changes have occurred to the fishery these changes in intensity and in area timing seemed likely to be controlled by the Base model.

There was a report of progress with interpreting the Taiwan and Korean CPUE data sets. It is hoped to have some results of this work for the 2014 ESC.

Two papers from Australia were presented. The first gave updated results from the GAM model being developed. Understandably, since this integrates over areas, this gave results that were closer to the CS than the VS versions of base series. The second paper provided the monitoring series formed of a random effects version of the base model (less by catch terms). This gave broadly similar results to the base model (Figure A4.3).

Finally, a paper from the Chair presented a Shepherd-Nicholson model of CPUE at age data to investigate the scale of any upq2008 effect. This concluded that since 2006 year effect had trended progressively upwards rather than showing a single step up (Figure A4.4). This trend seemed to be more compatible with a reduction in cumulative mortality following the 2006 quota reductions than due to a change in catchability.

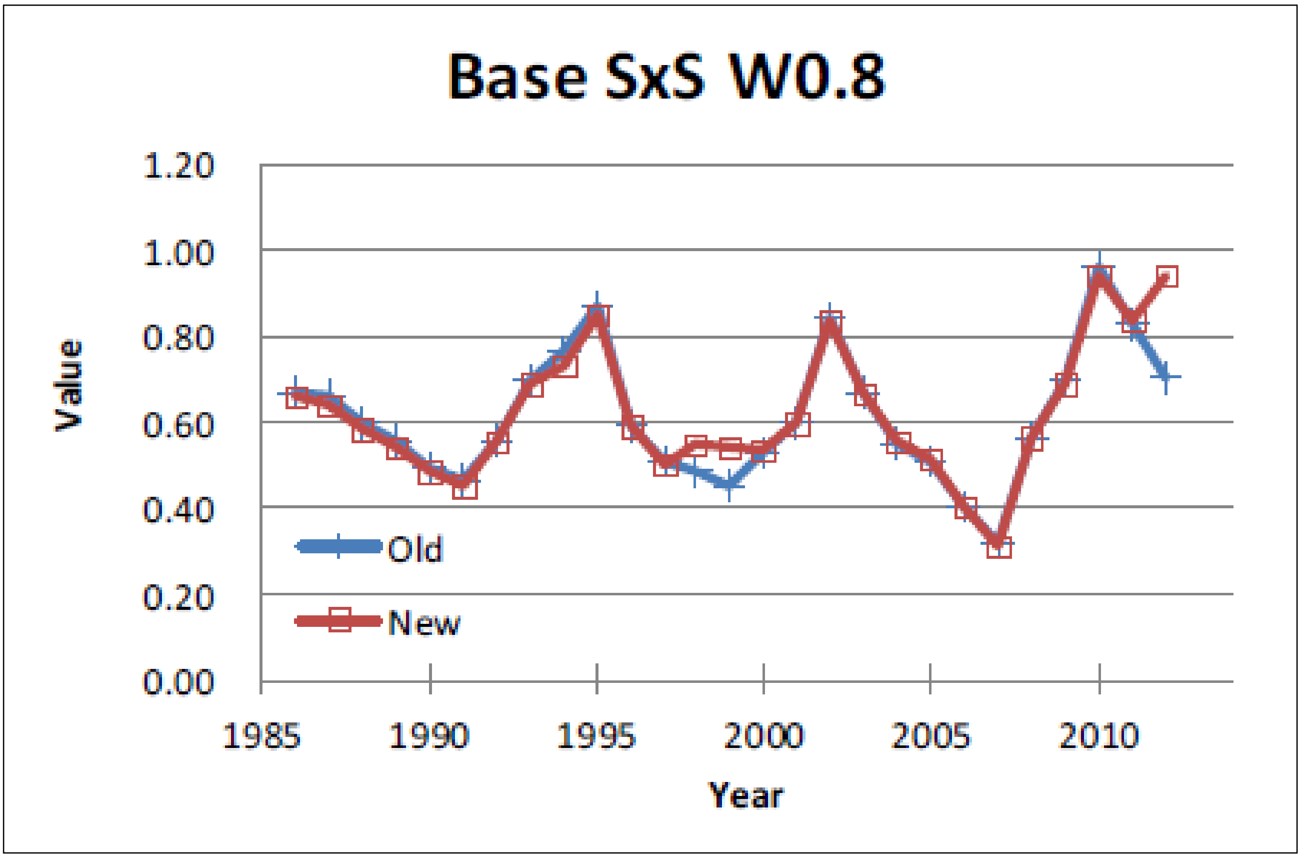

Figure A4.1. Comparison of effects of the corrections on the base series. From WEB meeting Paper 1.

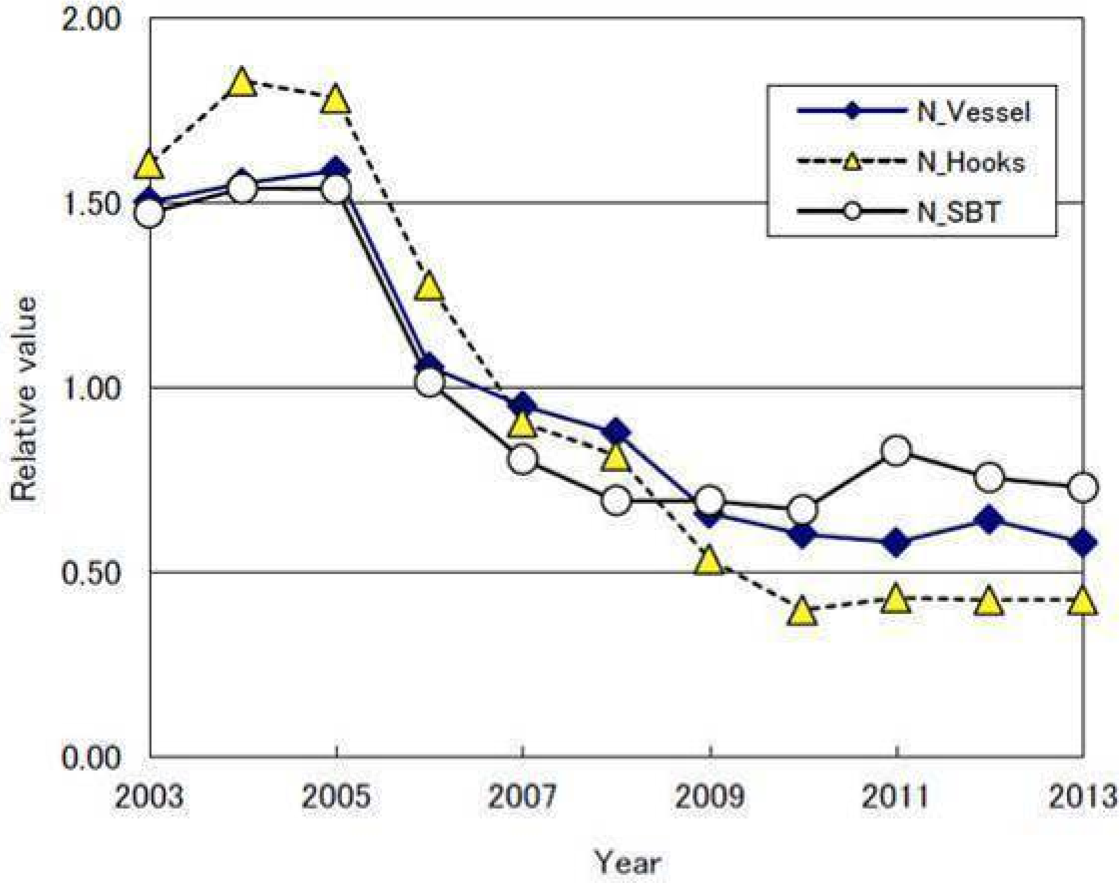

Figure A4.2. Changes in operations post 2005 from CPUE WEB meeting Paper 2.

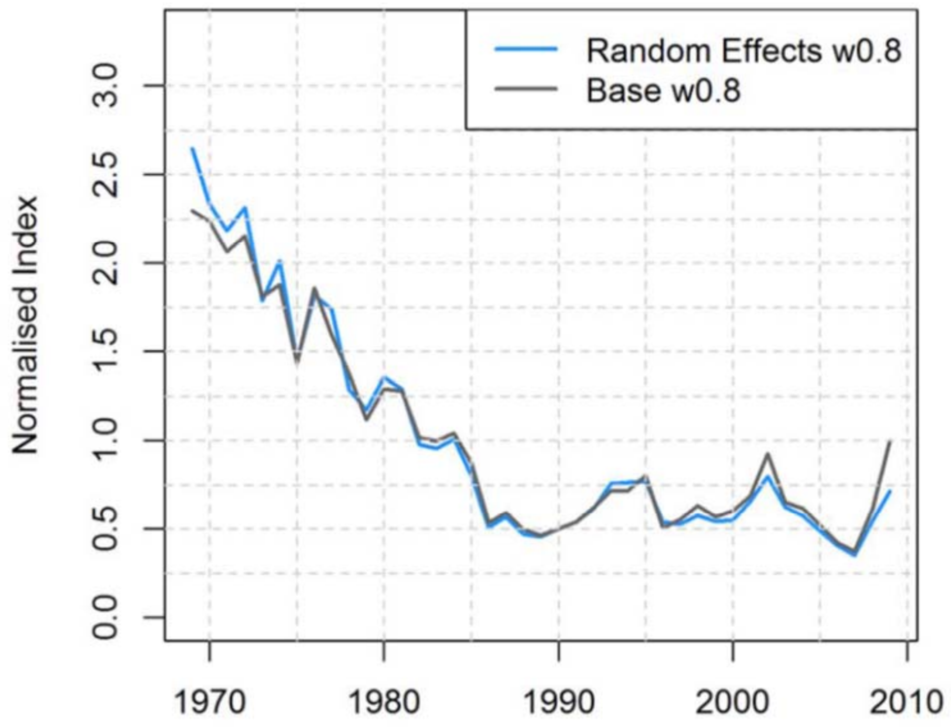

Figure A4.3. A comparison of the base series to one computed with random effects. From Web Meeting Paper 4.

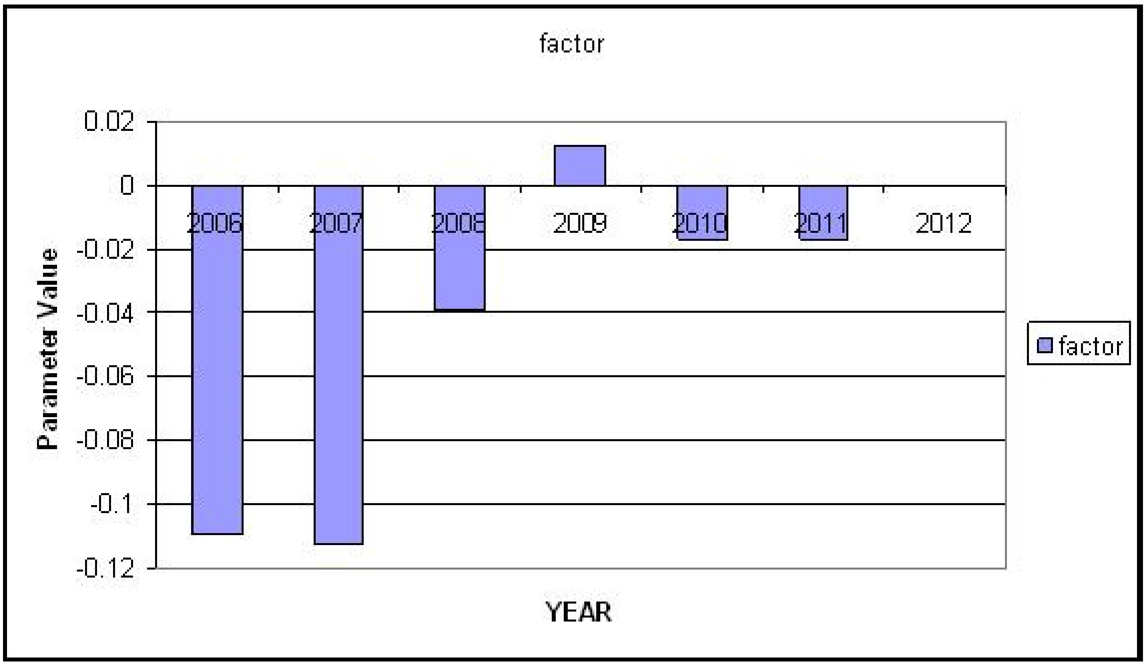

Figure A4.4. Trend in year factors post 2006. From WEB meeting Paper 5.

Attachment 5

Developing scenarios for unaccounted catch mortality

The OMMP meeting discussed the request from the Extended Commission in 2013 to conduct sensitivity analysis around all sources of unaccounted catch mortality (UAM) as part of the ESC's 2014 stock assessment, and noted:

i) The request to the Compliance Committee (ESC18, paragraph 144) had not provided additional information for the construction of UAM scenarios;
ii) The OMMP was not necessarily in possession of the information required to construct the full range of plausible scenarios for UAM; and
iii) Notwithstanding ii), The OMMP recognised the importance of all sources of mortality for the accuracy of assessments of stock status and scheduled review of MP performance in 2017.

The OMMP focused their attention on the range of potential sources of UAM, the required types and potential sources of information that could better inform scenarios of them, and strongly encourages the ESC, Compliance Committee and EC to work towards filling the gaps in the information base that currently limit the OMMPs ability to respond to the request from the Commission.

Methods

In developing scenarios for each source of unaccounted mortality added to the model, information is required on:

(i) the total volume of mortality in tonnes;
(ii) the time period over which the mortality applies; and
(iii) the likely size structure of this catch.

The size information is important to ensure that catches in the assessment model are removed from the appropriate section of the population. The proposed approach is to first identify all possible sources of mortality not currently included in the stock assessment of SBT and then develop plausible scenarios regarding the catch volume and their size distributions. In the current stock assessment catches are input to the Operating Model as one of six fisheries, which are assumed to have different selectivity patterns.

Each unaccounted source of mortality will be assigned to a fishery whose size distribution most closely matches as an expedient way to include these sources of mortality within the assessment. Concern was expressed that this approach might have unintended consequences, e.g., related to selectivity/mortality estimates.

Another consideration is the years over which to correct the catches for unaccounted mortality. It is proposed to estimate these additional mortalities from whichever year is appropriate and where there is information to develop estimates.

The sources of mortality as specified by the EC2013 include:

- Unreported or uncertainty in retained catch by Members, for example:
    - surface fisheries,
    - artisanal catch,

    - non-compliance with existing measures (e.g. catch over-run);
- Mortality from releases and/or discards;
- Recreational fisheries;
- Catches by non-members;
- Research Mortality Allowance; and
- Any other sources of mortality that the ESC is able to provide advice on (including depredation).

Sources of information

1. Unreported or uncertainty in retained catch by Members

(a) Surface fisheries

As in previous assessments, the 2014 reconditioned OM for SBT includes a 20% additional catch in weight to the Australian surface fishery which involved an adjustment to the age composition of the catch. This is based on the potential bias in the size sampling of the Australian surface fishery (ESC2006). The ESC has included 20% overrun to the catches reported for each year from 1999 (ramping up from 1% overrun in 1992 to 20% by 1999 and onwards to 2014).

Additional sensitivity runs with a 40% scenario (as with the 20%) will be conducted for presentation at ESC2014. This involves adjusting the age composition as was done for the 20% method (ramps up from 1% in 1992 to 40% by 1999 and onwards to 2014).

These scenarios may be refined in future based on agreed methods. Future work was discussed on:

- Analysis of more years data using the mixture distribution approach; further data are now available for 2011-13.
- Use of the mixture distribution approach applied to the CDS data since 2010 (if the data are made available to the ESC for 2014).
- Use of the model of growth in farms along the lines of that used in OMMP5-9 with alternative assumptions.

Also Table A5.1 summarises the discussions around data availability for further catch scenario developments.

There was substantial technical discussion about the approaches, particularly the assumptions required and potential biases (see previous ESC discussions on this topic), e.g., the length weight relationship. The method applied (OMMP5-9) relies on the weight length relationship at capture for tagged fish recovered in pens being well represented by the Robins LW relationship used for other wild-caught SBT.

(b) Artisanal catch

The catches reported from Indonesia have been updated by the Secretariat since the Commission meeting. The meeting agreed to request definitive catch data from the Executive Secretary and use these data in the model. Future scenarios should include an allowance of plausible catch overruns (e.g., continued at the current reported level).

(c) Non-compliance with existing measures (e.g. catch overruns)

There was no information available to assess this issue. The OMMP requests that further information on this being provided by the Compliance Committee noting the ongoing QAR.

2. Mortality from releases and/or discards

Each country was requested to provide the information outlined in Table A5.2 to enable mortality estimates to be determined for each fleet in each year. To facilitate implementation of scenarios, the data required are the number of fish released above and below approximately 112cm by life status (dead/sluggish or vigorous). Two alternative mortality values are initially proposed: 100% mortality of live releases—the maximum value—and 9% mortality (based on pop-up tags; ESC/1309/34). The smaller fish will be added to the catch for each year for fishery 6 (surface fishery) and the larger component will be added to the LL1 fishery.

Members were encouraged to provide further information to the ESC2014 meeting so that mortality ranges can be narrowed. For fisheries which lack information on discard rates (and mortality of those discards) the ESC may wish to consider using values from related fisheries.

3. Recreational fisheries

Published estimates from parts of the Australian recreational fishery were used to derive a catch history scenario from 1992 to 2013. The estimates for Victoria (2011) and Tasmania (2012) were added together and taken as current catch level (from 2012). The catches were ramped up linearly from the previous (1998) estimate to the 2012 value. New Zealand reports recreational catches. These catch estimates are to be added to the OM fishery 6 (corresponding to the surface fishery) based on average size.

Information was unavailable on recreational catch from South Africa.

4. Catches by non-Members

Information was generally unavailable on SBT catch by non-Members. The group noted that as the SBT stock increases bycatch of SBT in non-target fisheries will likely increase. In these circumstances, lack of information on SBT bycatch is of concern, especially in contrast to members' allocated catch.

The group proposed a method for developing scenarios by applying SBT bycatch rates in the longline fleets (e.g., in the WCPFC and IOTC fishing zones) to the effort by non-members in the same areas and months. The meeting agreed that Members should evaluate the bycatch rate of their own longline fleets since they have access to the data and understand their longline fisheries.

5. Research Mortality Allowance

The catch made against the allocations of research mortality are already included in the OM.

6. Other sources of mortality

No other sources of mortality have been quantified.

The group noted that SBT depredation by marine mammals in some fisheries might be considered.

Table A5.1: Summary of the discussion on current data availability useful for developing scenarios for Australian surface fishery catches.

Data availability:	Yes/No
40/100 fish sample	(Yes)
Total number caught into pens	(Yes)
Total number surviving to market (TIS and CDS data)	(Yes)
SRP tagging data into farm/pens	(Yes)
CDS size composition	(No)
This information would be useful for validating the size composition of SBT that appears on the market. Request that these data become available for all fleets through the Secretariat.	
Japanese market size composition of SBT	(No)
Same as above; except the request would be directed to the Japanese fisheries agency. Data from 2007-2010 would be useful as analyses have already been presented using data from that period.	

Table A5.2: Mortality estimation for releases/discards in longline fisheries
To be completed by fishery, and year where possible. The cut-off for small-large is ~112cm as a proxy for 30kg SBT (based on mid-point of the middle category (20-40 kg) in paper OMMP/1406/08.

Size	Condition	Alternative	Number	Mortality proportion	Total dead	Effective Discard Biomass	Technical Implementation in assessment model
Small	Dead	1		1.0			Fishery 6
Small	Vigorous	1		1.0			Fishery 6
Large	Dead	1		1.0			Fishery 1
Large	Vigorous	1		1.0			Fishery 1
Small	Dead	2		1.0			Fishery 6
Small	Vigorous	2		0.09			Fishery 6
Large	Dead	2		1.0			Fishery 1
Large	Vigorous	2		0.09			Fishery 1

Note: Small to be added to fishery 6 (surface fishery) and large to be added to fishery 1 (LL1). Alternative 1 has assumption of 100% mortality of live releases/discards.