Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the Second CPUE Modelling Workshop

21 – 25 May 2007
Shimizu, Japan

Report of the Second CPUE Modelling Workshop
21-25 May 2007
Shimizu, Japan

Agenda Item 1.   Opening

1. The Chair, Professor John Pope, welcomed delegates, described the strategy for conducting the meeting and opened the meeting. An illustration of the strategy for addressing the Terms of References (ToRs) is shown in Figure 1.

2. The hosts (Japan) explained the working arrangements for the meeting.

3. Participants introduced themselves. The list of participants is shown at **Attachment 1**. Rapporteurs for the various sections of the meeting report were appointed from amongst the participants.

4. The agreed agenda is shown at **Attachment 2**.

5. The agreed document list is shown in **Attachment 3**.

6. Some countries took the opportunity to make opening statements (these are shown at **Attachment 4**).

Agenda Item 2.   Terms of Reference 1: Description of any changes in fishing patterns

2.1 Presentation of relevant papers

7. Paper CCSBT-CPUE/0705/05 was presented by Dr Itoh. In the document, changes in operational pattern of the Japanese SBT longliners resulting from the introduction of the new regulation system in 2006 are examined based on the RTMP data. In 2006, comparing to the averages during the period 2001-2005, the total number of hooks used by this fleet decreased to 73%, and the number of SBT caught was decreased to 62%. The proportion of small fish in the total catch was larger in 2006. The number of cells operated in terms of 5-degree square months was increased in 2006 especially in areas 8 and 9. This was due to the lifting of the seasonal area closure which allowed fishing in more months. On the other hand, the number of operations per cell was decreased to about half of the previous average. Most vessels fishing SBT in 2006 were the same that fished in 2005, and no remarkable changes in operational pattern were observed as they tried to utilize their individual quota (IQ) as effectively as possible. In 2007, because IQ was further reduced and because fishermen are becoming more familiar with how to effectively use their own IQ, careful monitoring and examination of the data on the operational pattern should be continued. In order to minimize the effect of the change of the fishery management

system on the stock assessment, having plural abundance indices from different SBT fisheries is urgently needed for the robust stock assessment and stock management in the CCSBT.

8. It was asked whether discards occur for less valuable smaller fish in order to utilize IQ the most efficiently. Dr Itoh explained that discarding of SBT was unlikely to occur taking into account the attitude of Japanese fishermen to fish they have once caught. In addition, he replied that it is possible to examine the possibility of discards by comparing log book data to the catch data recorded by scientific observers. Furthermore, Mr Sakamoto stated that the new Japanese SBT management system included the requirement of individual tagging with sequential numbers, which made it difficult, if not impossible, to highgrade fish.

9. Members considered the increase of small fish observed in Japanese SBT longline catch in 2006 as shown in CCSBT-CPUE/0705/05. Dr Itoh suggested that because small SBT occur in wide areas and seasons in 2006, it was not likely due to a change in the sizes targeted.

10. In regards to by-catch of other tuna species e.g. yellowfin tuna (YFT) and bigeye tuna (BET), Dr Itoh explained that Japanese longline operations targeting SBT conduct fishing operations in the area around 40S, where no yellowfin tuna are caught and few bigeye tuna are caught. Targeting was considered to be an issue between-areas, rather than within the CCSBT area. No trend that the SBT fishing ground had shifted to the north was observed.

11. Elements of paper CCSBT-CPUE/0705/08 were presented by Prof. Wang. In particular he noted that changes in fishing behaviour (Figure 2) of the Taiwanese fleet had resulted in an increased CPUE after 2004. This paper was discussed in greater detail under agenda item 7.

12. Elements of the 2006 NZ National Report were also relevant to this agenda item and presented by Dr Harley. It was noted here that there had been substantial changes in the behaviour and size of the NZ Domestic fleet following the change from an Olympic management system to ITQ management in 2004. The Japanese Charter fleet had operated more consistently over time. This indicates how a change in management can radically influence CPUE measures. The possible use of CPUE from the NZ Domestic fleet is further discussed under agenda item 7.

2.2 Conduct any relevant calculations

13. The need to understand what changes would be of most concern could best be described by charts showing areas/times of high and low SBT catch rates and areas of high by-catch rates. These charts are shown in Figure 3 and Figure 4 which show the spatial distribution of the catches of SBT, bigeye tuna and yellowfin tuna by season.

14. An indicator of changing fishing patterns might be supplied by plots of mean/median of latitude, longitude and month of catch and effort. These would indicate if the

distribution of catch or effort in a year was typical or abnormal. Examples of such plots are shown in Figure 5.

15. It was further considered that "significant" divergence between the annual trend of CPUE resulting from GLM's and nominal CPUE might indicate if fishing behaviour had markedly changed. For example, Figure 6 shows the shift in effort relative to catch by latitude and month. Also, Figure 7 shows the pattern in catch-at-age estimated from the reported 5x5 data which was recompiled by the Secretariat at the start of the meeting.

2.3 Synthesis and conclusions to forward to ESC

16. It was concluded that, despite the changes in the Japanese management system, from the evidence seen the Japanese effort distribution in 2006 was not markedly different from previous years. However, the response of the Japanese fleet to the new management system was still developing. Consequently there was a need both to understand what changes would be of most concern and to monitor how well new data corresponded to past distributions.

17. Given the uncertainties about the fishing patterns that the Japanese longline fleets may have in the 2007 fishing season it would be helpful if Japan could provide suitable details of its distribution to SAG/SC. Also, because of possible changes in fishing strategies of the Japanese fleet after the 2007 fishing season, depending heavily on Japanese fleet data in stock assessment process may lead to further uncertainty in the stock status. Therefore, it is necessary to develop reliable stock indices from the other fisheries and/or research, which will be used in the stock assessment process in addition to the Japanese CPUE (as discussed under Agenda item7). The following recommendations regarding ToR 1 are proposed:

- Provide information on any changes in fishing patterns which might affect CPUE
- Continued monitoring of:
  - SBT/sum(BET+YFT) catch by area for the areas and seasons which are selected for CPUE standardisation.
  - Median latitude and longitude by area the areas and seasons which are selected for CPUE standardisation.

Agenda Item 3.   Terms of Reference 2: Analyse past long line CPUE data to best specify one or more robust future CPUE series for high seas components of the SBT stock

3.1 Presentation of relevant papers

18. This ToR was concerned primarily with reappraising the standardisation and subsetting methods applied to the various high seas long-line data sets, to obtain one or more robust CPUE series, for this portion of the stock. Papers related directly to this section would be CCSBT-CPUE/0705/06, CCSBT-CPUE/0705/09, and a paper

linkage with ToR 6 in paper CCSBT-CPUE/0705/08 where the Taiwanese long-line data is analysed. This ToR was discussed in conjunction with ToR 4 and 5.

19. Paper CCSBT-CPUE/0705/06 presented a comparison between the CPUE obtained, using a single GLM standardisation model, when using observer and log-book data. Explanatory variables included were vessel-ID, spatio-temporal factors, hooks-per-basket and observer. The main conclusion of the paper was that using data when observers were present, and when they were not, produced largely similar standardised CPUE series. The paper concludes that the Japanese long-line CPUE data are usable, without adjustment, in the stock assessment of southern bluefin tuna.

20. Paper CCSBT-CPUE/0705/09 analysed the effect of standardising the Japanese long-line data at the shot-by-shot and 5x5 monthly levels of aggregation. In this case, given the comparison across fine-scale and more aggregated spatio-temporal levels, the vessel-ID effect and hooks-per-basket effects were removed due to the difficulty of their definition in the aggregated data, but there was a more complex spatio-temporal structure to the GLMs, that was not employed in paper CCSBT-CPUE/0705/06. Estimated trends appeared dependent on both the specifics of the GLM used, and the dataset to which the GLM was applied to.

3.2 Conduct any relevant calculations

21. Much of the discussion and work conducted during the meeting was directed at specifying a robust CPUE series. Here are the key issues discussed by the group:

- Is the Japanese longline data currently used suitable for generating robust CPUE series, e.g. is there evidence of contamination of the data relating to the findings from the Market Review?;
- Should the CPUE analyses consider data for all vessels that fish within a chosen time /area strata or should a subset of 'core' vessels be used instead?;
- Can consideration of bycatch data (particularly the other target tuna species) assist in the development (e.g. choice or time / area strata) and interpretation of CPUE indices?;
- Are analyses based on shot by shot data more likely to provide more robust CPUE indices than those based on aggregated data. Noting that shot by shot data allow the incorporation of additional information such as vessel details, fine scale position data, and hooks per basket?;
- What approaches should be used when modelling shot by shot data, particularly in relation to observed zeros?;
- Are the current time / area strata appropriate given the inter-annual changes in the fishing seasons allowed under the Japanese fishery management system and information on the catches of other tuna species?;
- Whether model factors such as vessel should be treated as Fixed versus Random effects; and
- What factors should be considered when comparing logbook and observer data.

Consideration of Japanese longline data

22. Analyses considered under ToR 5 were inconclusive so it cannot be determined if the Japanese longline CPUE in Areas (4-9) and Months (4-9) are affected by the issues described in the Japanese Market Review.

Selection of a subset of vessels for CPUE analyses

23. It was noted that the standard Japanese 5x5 catch and effort data comprised information from over 700 vessels (based on data for 1986-2006) and the working group considered that it might be useful to see if a subset of the fleet could be used for CPUE analyses. This could reduce the influence of vessels that only occasionally enter the fishery and/or may be targeting species other than SBT (leading to higher proportions of observed zeros). As a starting point for consideration of this matter, it was thought that it might be useful to obtain a subset of around 100 vessels.

24. A key consideration was the criteria used to determine which vessels should be included in this subset. At the workshop one **possible** criterion was developed. A vessel was included in the subset if it was represented in the top x catching vessels in a single year more than y times during the period 1986-2006 (21 years). For example, 108 vessels were in the top 70 (x) catching vessels for the year more than 4 (y) times.

25. This criterion involves a trade-off between vessels that are catching most of the SBT in a year (x) versus the number of years that they have been a 'top' vessel (y). Different combinations of x and y can be used to obtain the same sized subset. Two examples illustrate this point:

- small values for x and y would favour the 'top performing vessels' over those that had been in the fleet consistently over time; and
- large values for x and y would favour the vessels that fish consistently over those that are top performers in some years. It may also exclude new entrants to the fishery that have not been in for y years.

26. When a subset was determined, the coverage of the overall fishery by this subset, in terms of vessels, annual effort and catch, was calculated to see if it was adequate. The working group considered that this type of approach was useful, but that it was not useful to try and come up with a best set of parameters (x and y) at the workshop.

27. Nevertheless, a subset of vessels (based on x=61 and y=3) was created for the purpose of undertaking analyses during the workshop. The output for one set of criteria is provided in Table 1. For this example, the coverage of catch by the subset of vessels increased from a low (17%) level in 1986 to peak in 2000 (62%) and declined slightly from there to 2006 (46%).

28. To examine the cause for this, an analysis was undertaken of the first and last years that a vessel operated in the core areas and seasons and is also provided in Table 1. The low coverage of the subset for the early years could be due to the large number of vessels that 'left' the core fishery over the period 1986-1990. These vessels may

have been responsible for much of the catch in the early years, but were not in the fishery for enough years to meet the *y* criteria. In the same way, the entry of new vessels (though at a low level) to the core fishery near in the final years leads to a reduction of coverage at the end of the time series. The pattern of renewal and attrition of the SBT fleet (as it appears in the database) is shown in Figure 8.

29. In reaching conclusions on this work, the working group concluded that the **concept** of obtaining a subset of vessels was a good one, but based on the results above, further work was required. Issues to be considered into future work should be:

   - how large the subset should be;
   - what levels of coverage are required, e.g. both absolute levels of catch and spatial distribution of the catch
   - trade-offs between continuity (number of years in the fishery) versus high SBT catches;
   - whether a different criteria could be used to select the fleet over time, e.g. a moving time window

   Consideration of bycatch data

30. Catch data for the bigeye and yellowfin tuna were considered by the working group to gain insights into the most appropriate times and areas for developing robust CPUE indices (Figure 9), and for assessing the possible affects of changes in targeting on the catch rates of SBT (Figure 3 and Figure 9).

   Consideration of shot by shot data

31. Further analyses comparing shot by shot to aggregated data were undertaken, building on those described in CCSBT-CPUE/0705/09. In particular the analyses of shot by shot data were extended to include factors such as *vessel* and *hooks per basket*. It was found in such analyses that *vessel* explained a large proportion of the variance. Also it was found that the estimated trends between analyses at 5x5 and shot by shot differed when these additional variables were included in the shot by shot analysis (Figure 10).

32. Further, the effect of finer location such as latitude can be included into the GLM, which can provide information on potential targeting that can not be obtained from coarser data. Figure 11 shows the relationship between hooks-per-basket and catch rates for different tuna species.

33. It was noted that the proportion of observed zeros was higher when shot by shot data were used. Further work is required for the best way to incorporate these zeros, e.g. the addition of a small constant versus the use of approaches such as the Delta-lognormal. The working group note that careful consideration of the time, area, and vessels to include in the CPUE standardisation should reduce the proportion of zeros.

   Appropriateness of current time / area strata

6

34. Consideration of fine-scale bycatch data suggest potential modifications to existing strata, but there was insufficient time to achieve this. Analyses were undertaken comparing the CPUE trends from the original strata with the Japanese fisheries management areas and season.

35. The apparent trend in the CPUE of the core vessels was strongly influenced by whether the data was restricted to Area (4-9) : Month (4-9) (dataset A) or to Areas (4, 7, 8, 9) for the periods when the Japanese fishery management zones were open (Table 1, CPUE/0705/06) (dataset B). The former data set includes periods without directed SBT fishing in some month:area cells while the latter includes some cells in some years and not others. Both problems might cause aliasing with the year effect and lead to differences seen in Figure 12.

Considerations for comparing logbook and observer data

36. Comparison of observer data with logbook data should take into account the following sources of variability:

1. **The completeness of the sampling frame** (i.e., the list) from which vessels are selected for observer deployment. Does the list include all vessels in the fishery for which inferences about catch and effort are to be made? If the list omits an appreciable portion of vessels in the entire fleet, then even a census (observers on all vessels and trips on the list) could yield poor (biased) estimates.
2. **Bias caused by the procedure for selecting vessels** from the sampling frame. In principle, this type of bias is trivial to document. Censuses, or probability-based sampling of vessels from a complete frame, are the only selection methods that eliminate selection bias from a statistical point of view. Thus, ad-hoc selection may not guarantee that repeated selections result in samples that, on average, represent the fleet,
3. **Bias in the sample of vessels on which observers are actually deployed**. This type of bias can occur even when vessels are randomly selected from a complete list that covers the fleet, and is often difficult to eliminate. This form of bias is often caused by logistical constrains, for example when vessel operators refuse to take observers, or when some of the vessels selected for observer deployment are un-safe or do not have space for observers. In principle, an ad-hoc selection with full compliance may cause no more systematic errors than a random selection procedure with poor compliance.
4. **Bias caused by changes in fishing behaviour when observers are deployed**. This latter form of bias is the most difficult to evaluate and correct for. Unbiased samples of vessels from a complete sampling frame and the deployment of observers on all vessels selected may yield estimates with systematic errors if the vessel operators minimize by-catch for observed trips (or tows within a trip) or otherwise change their fishing strategy.

Considerations for explanatory variables other than spatial temporal factors included into the GLM

37. When analysing the shot-by-shot data, vessel-ID was incorporated into the GLM as a fixed effect, but it could be argued that the effect of an individual vessel (skipper skill, crew and boat efficiency) would be random, and not linear, and there is likely to be some level of between-boat variation in the catch rates. Both these issues would suggest that the vessel-ID might be better incorporated as a random effect. This would also have implications for the precision of the estimated CPUE series, as with only fixed effects, and many data entries, one normally observes small confidence intervals around the CPUE series, as was seen in paper CCSBT-CPUE/0705/06. However, with random effects, one can see much wider confidence intervals in the estimated CPUE, as the variability in the random effects is, in effect, "added" variance in the observations. A sensible estimate of precision in the estimated CPUE indices is preferred, as it is necessary to assess the potential significance in changes in CPUE trends both within and between series. Also, it was suggested that one should not include both vessel-ID and ship-size together in the GLM, as these two factors can easily confound each other: a good skipper with a small boat can have the same catch rate as a bad skipper on a large boat, although it is possible to incorporate both factors (i.e. *vessel* and *ship size*) as nested variables. The working group noted, that the identification of key factors in the GLM and the best datasets for analysis were more important, but that the correct form of the GLM and credible estimates of precision were key issues, and required ongoing work.

3.3 Synthesis and conclusions to forward to ESC

38. Recommendations for ToR 2 are as follows:

- The approach of sub-setting the fleet to a set a core vessels may provide more robust indices;
- Consideration of bycatch data are clearly critical for the interpretation of CPUE and development of robust CPUE series. The workshop agreed that bycatch data be analysed for any fleets for which CPUE should be considered and some workshop members felt that these data should be submitted as part of the data exchange;
- When set-specific details are incorporated into GLMs (e.g. HPB and vessel ID), different trends are estimated to those implied by aggregated data that does not consider these factors.
- Further efforts should be directed at comparing shot by shot and aggregated data to see which provides a better reflection of the stock, but it is likely that the information provided by shot by shot data should lead to more robust indices.
- Efforts should be made to include better information in relation to targeting practices in CPUE analyses.
- There is a significant difference in the CPUE trends for the traditional CPUE strata compared to the Japanese fishery management areas (Figure 12). This problem requires collaborative intersessional work to resolve.
- Further collaborative work is required on approaches for modelling observed zeros and the comparisons between fixed and random effects approaches to modelling effects.

Agenda Item 4. <u>Terms of Reference 3: Is additional commercial sentinel fishing or scientific effort needed and is this practical?</u>

4.1 Presentation of relevant papers

39. Background document CCSBT-CPUE/0705/BGD01 outlines a proposal prepared in 1999 for a joint experimental fishing program for SBT. The intent of this proposal was to provide a fishery-independent index to eliminate the uncertainty associated with CPUE information. The proposal outlines an experiment to be repeated each year for 3 years, restricted to statistical area 8 to satisfy practical constraints. The stratified sampling design required vessels to commence operations in particular 2x2 degree squares, with 330 operations to take place in July and another 330 in August, involving the use of 15 vessels. The proposal recommended 100% observer coverage for the operations to be undertaken.

40. Following consideration of this background document, the working group discussed options for sentinel fishing to provide an alternative to, or to augment, CPUE information. Options highlighted in the discussion were:

- Developing a survey (or some level of directed fishing) of spawning biomass on the spawning grounds. The only information from this region at present is from Indonesian fishing and is inadequate to provide information on relative abundance. Although there are practical difficulties in arranging a survey in the region, it was recognised that the potential information on spawning biomass levels that could be gained would be very valuable in the absence of an informative CPUE series.

- Recognising that potential changes in fishing patterns of Japanese longliners as a result of changes of management system in 2006 could lead to gaps in the coverage on which future CPUE series will be based, it was suggested that there could be "insurance" value in directing some level of fishing in time/space to enhance coverage to improve the value of future CPUE data This approach would have to be flexible to enable targeting of specific areas/months to provide continuity in the CPUE series.

- The possibility of examining historic data to identify a reduced set of specific areas/months for limited survey work to provide relative abundance information. Appropriate areas/months would have catch rates that are consistent with overall trends.

41. It was indicated that the approximate cost of chartering a Japanese longliner for directed fishing operations was at least 800,000 yen per day. An approach that provides an incentive for vessels to function commercially would be preferred.

4.2 Conduct any relevant calculations

42. The historical CPUE series were examined at a 5 by 5 degree level to determine areas/months that have catch rates consistent with overall trends. Statistical areas 4

and 9 were shown to have these properties. In order to isolate more specific areas and months where limited survey work would provide appropriate relative abundance information, analysis of historical data should be carried out inter-sessionally at the shot by shot level. This analysis could consist of isolating areas and times in areas 4 and/or 9 where fishing for SBT has occurred consistently for the last 10-20 years. By bootstrapping from the historical set by set data in these areas and calculating CPUE's based on these bootstrap estimates, the adequacy of specific areas to replicate the trend of the overall series would be determined and the confidence levels of such estimates obtained. By varying the sample size used in the bootstrap replicates, the accuracy of the CPUE series obtained using different size surveys would be determined. However, during the meeting participants did not have enough time to discuss the practicalities of carrying out this exercise.

4.3 Synthesis and conclusions to forward to ESC

43. These possible approaches were not developed further at the meeting. Document CCSBT-CPUE/0705/05, presented at the workshop, indicated that there were no remarkable changes in fishing patterns in 2006 following the introduction of individual quotas. The 2007 fishing season began on 1 April 2007, thus there is limited information on changes in the fishery for this year. Examination of changes in the fishery in 2007 as data become available throughout the year may reveal the need for developing these options further.

44. Since the situation for the 2007 season will become clearer as the season advances, recommendation on this Term of Reference are best left until the time of the SAG\SC meetings. This will also allow any decision on such initiatives to be taken in the context of the review of wider scientific research priorities. This should be considered simultaneously with the analysis of CPUE data for the Indonesian fleet.

Agenda Item 5.   Terms of Reference 4: Is it possible to calibrate future series to past series?

45. This Term of reference was dealt with concurrently with Term of reference 2 and is reported under that heading.

Agenda Item 6.   Terms of Reference 5: Is it possible to correct past CPUE series?

6.1 Presentation of relevant papers

46. CCSBT-CPUE/0705/BGD02 was presented. CCSBT-CPUE/0705/BGD02 explored information relative to the relevant plausibility of the different CPUE scenarios for how catch anomalies of SBT may have affected the CPUE time series. It noted that the market review (Lou et al 2006) identified four possible sources for the catch anomaly. Not all possible sources affect the estimates of CPUE used in the

assessment. CCSBT-CPUE/0705/BGD02 compared catch rate estimates from vessel reported data and observed data (from Japanese longline vessels), collaborative Real Time Monitoring Program (i.e. the RTMP during 1991-1995) and the AFZ observer program (1991-1997). For both the RTMP and AFZ data, the vessel reported catch rates tended to be similar to, or to exceed those reported by observers. Overall, the RTMP and AFZ observer data presented in the report provide no indication of consistent under-reporting of SBT catch rates in the logbook data used for the estimation of CPUE trends, at least for the period 1991-1997.

47. CCSBT-CPUE/0705/BGD02 also examined the potential for historical latent effort within the Japanese SBT fleet. It found that no more than 36% of the available fishing days for SBT vessels would have fallen within official SBT seasons, indicating that substantial latent effort existed within the SBT fleet. Hence, it cannot be considered implausible that potential fishing activity derived from this latent effort was a potential source of a component of the SBT catch anomaly.

48. CCSBT-CPUE/0705/BGD02 also calculates estimates of the number of days that would have been required to catch the additional catch indicated by the catch anomaly, assuming that all of this additional catch came from Japanese SBT vessels but outside of the period and/or areas used in the CPUE calculations. Based on these results the hypothesis that CPUE was unaffected by the catch anomaly cannot be considered implausible. Further, if the vessels taking the catch anomaly were able to concentrate their effort in areas and time periods with high catch rates, then the number of days that would have been required would have been similar to that before there was any substantive catch anomaly. CCSBT-CPUE/0705/BGD02 further noted that reported effort in Area 2 increased dramatically after catch quotas became restrictive on the Japanese fleet, but catch rates there remained low. This could reflect displacement of effort towards bigeye tuna, when the SBT fishery was closed, or to an area where catches and possibly location of effort, was mis-reported. Calculations of the amount of SBT that this effort in Area 2 could have caught indicate that it would have been sufficient to be an important component contributing to the catch anomaly.

49. CCSBT-CPUE/0705/06 was presented. In this document, the scientific observer report and the shot by shot commercial fisheries data (logbook data) from the Japanese longline vessels over 1992-2005 were analyzed in order to get qualitative insight with respect to the reliability and applicability of these data for the stock assessment purpose. The paper concluded that there was little difference between the mean CPUEs from the same data sets reported by the observer and by the logbook. This result suggested that the trend of CPUE based on the reported data by vessels is consistent with the scientific observer data.

50. When nominal CPUEs were compared for the presence or absence of an observer in the logbooks, there was some indication of higher CPUEs with a presence of an observer in the late 1990s, whereas the opposite indications occurred in other years. There is an evident reason for the high CPUEs for operations with a presence of

observer in 1995 and 1996; SBT smaller than 25 kg were released in these two years by vessels that did not carry observers on board.

51. Some working group members did not believe that the analysis was conclusive and the conclusion of the paper was premature.

52. The group noted that although the figures did not show large differences in the CPUE time series with and without observers, the ANOVA showed statistical significance of both the observer and observer*year effects. It was also noted that the differences in the standardised CPUE series with and without observers appeared to be statistically significant, given the confidence intervals. Technical issues were discussed in regards to the GLM analysis, in particular whether the vessel id term should be included as a fixed or random effect and the effect of this decision on the prediction confidence intervals. Japanese participants agreed to investigate the effectiveness of the use of the vessel ID as a random effect in the model.

53. Participants discussed the higher CPUE with observers than without in 1999. While the release policy may explain the anomaly in 1995-1996 it does not relate to 1999.

54. The group acknowledged that the observer coverage varies from 4% to 9.6% of vessels during 1992-2006 (Figure 13).

55. CCSBT-CPUE/0705/09 was presented. Comparison was made between shot-by-shot data (SbyS data) and raised data in 5x5 degree and month (L5 data). The data sets used were based on Japanese longline fishery using the Japanese SBT quota during 1986-2006, not including shot-by-shot data fished under the joint ventures with New Zealand or Australia. The coverage of SbyS data to the L5 data was high in all years with an average of 96% in Area 4-9 in number of southern bluefin tuna caught. Trends of standardized CPUE series between SbyS and L5 were rather similar to each other.

56. It was noted that there are a large number of covariates available at the shot-by-shot level. The group agreed it would be beneficial to see whether these covariates have a significant effect on the analysis carried out in CCSBT-CPUE/0705/09. It was stated that this has been an issue that has been discussed at CCSBT for some time. Analyses in the past have shown little difference in trends, however it is apparent that shot by shot data can provide additional information and it would be possible to include additional variables such as hooks per basket and vessel id.

57. With respect to incorporating targeting the analyses in CCSBT-CPUE/0705/09 were extended to include a targeting term. The year trend of standardized CPUE for SBT was calculated incorporating the effect of other species' catch (i.e. bigeye tuna (BET) and yellowfin tuna (YFT)) into the GLM and compared two CPUE series with and without catch of BET/YFT to distinguish the target species.

58. Professor Butterworth emailed the workshop a copy of his approach to correcting for by-catch based upon including the CPUE of the by-catch species as an independent

variable in the regression of ln(CPUE of the target species). It was noted that this approach assumed that:

- The effort directed at by-catch species was small compared to that directed to SBT.
- The biomass trend of the by-catch species was constant (or known).

6.2 Conduct any relevant calculations

59. Following on from the above discussion, a number of analyses were suggested and discussed by members on the groups:

- In the review of the Japanese market anomalies there is a list of vessels that have violated Japanese fisheries laws. Comparison of the CPUE trends of those vessels with other vessels in the fleet may provide some indication of whether these vessels have reported significantly different catch or effort data than the remainder of the fleet.

- As stated in the market review, 12 vessels reported unusually high SBT catch for the last 10 days of the 2005 season. These catch rates were equivalent to 20 times the normal CPUE. The review also states that most of the other vessels catch reports showed a significantly higher quantity of catch during this period than their catch reports in November. Analyses comparing nominal CPUE for these 12 vessels that had very anomalous catch reporting at the end of 2005 to the core fleet were not conclusive. In some areas CPUE for the 12 vessels were lower than the core (as would be expected if they underreported), but in other areas they were higher (Figure 14). It was concluded that the CPUE of these 12 vessels fell within the expected range of "noise".

- Calculation of the CPUE of the 40 vessels found to be misreporting in 1996 (as outlined in CCSBT-CPUE/0705/BG02). The group was unsure about whether the vessel id's of these 40 vessels were available. This analysis was not pursued further.

- Determining whether some sets with large bigeye or yellowfin tuna catch have targeting characteristics of SBT. It was noted that the observer data analysis (CCSBT-CPUE/0705/06) suggested it is unlikely there were large catches of SBT labelled as bigeye tuna in areas where there are observers. For the area north of 30S, there may be some SBT catch but there are no observers on board vessels in the area. Figure 4 shows example patterns of positive SBT catches by month and in general. This type of approach could be useful to define strata for setting up fixed geographic area-month combinations for refining CPUE indices.

- Comparison of CPUE in area 6 for Japanese vessels outside the NZ fishing zone and inside the zone, as these are similar geographical areas and the vessels fishing inside the New Zealand zone have a high level of observer coverage. This analysis was not pursued.

6.3 Synthesis and conclusions to forward to ESC

60. The data examined showed no clear evidence on if or how to correct CPUE series. It was suggested

- Ideally CPUE would be based on vessels in which we have good confidence in their data.
- It is unsuitable to develop CPUE based solely on observed vessels because the scientific observer program was not designed to collect CPUE solely.
- Analyses undertaken at the workshop comparing observed and unobserved datasets on all and just the core vessels were not conclusive as to whether the effects of the market anomalies could be detected – this is in part due to levels of observer coverage across the vessels varying from 4-9.6%.
- Analyses comparing nominal CPUE for the 12 vessels that had very high catch reporting at the end of 2005 to the core fleet were not conclusive. In some areas CPUE for the 12 vessels were lower than the core (as would be expected if they under-reported), but in other areas they were higher.
- Given the sensitivity of the assessment to the assumption that overcatch should impact on the CPUE used in the assessment, Japan is therefore encouraged to undertake future analyses of this kind for components of the fleet for which they have greater (or lesser) confidence in the accuracy of their catch reporting.

Agenda Item 7. Terms of Reference 6: Analyse fisheries to try to develop or improve additional indices other than Japanese longline

7.1 Presentation of relevant papers

61. This ToR was focussed at the potential to develop CPUE indices from fisheries other than the Japanese longline fleet. Under this item, two papers were presented and one presentation was provided without a paper.

62. CCSBT-CPUE/0705/08 presented the CPUE standardization for SBT caught by Taiwanese longline fishery during the period of 1996-2005 using generalized linear model. Besides the update of CPUE standardization of SBT for the entire CCSBT statistical areas, this report also provide standardized CPUE for the main fishing areas and the main fishing seasons. The nominal CPUE in 2004 and 2005 were obviously higher than those before 2003 and this might be resulted from decreasing effort for SBT and stable catch of SBT. The trend of standardized CPUE was more stable than nominal CPUE. However, the data used in this report were based on the CCSBT database for 1996-2002 and on the logbook data for 2002-2005. The different data source used for two time period might lead to the bias for standardization analyses. Therefore, the further analyses should be performed when the revised data are available.

63. Dr Harley provided a brief description of the New Zealand fishery in terms of its operation and utility for CPUE analysis. The presentation was based on the National Report provided to the ESC in 2006. Prior to the introduction of SBT into a Quota Management System (QMS) from 1 October 2004, the NZ fishery was managed under a competitive catch limit with real time monitoring of catches. In several years the fishery was closed well before the end of the season, i.e., SBT was still abundant within the EEZ.

64. The charter fleet is typically comprised of 4-5 vessels each year, though only 2 vessels were used in 2004 and 2005. Data for this fishery are currently included with other Japanese data in the suite of standardised CPUE analyses. Observer coverage for these vessels is typically high (in most years all vessels carry observers) and currently these data are not being utilised in any CPUE analyses.

65. The number of domestic vessels (and their effort) increased dramatically in the late 1990s and early 2000s, prior to the introduction of SBT to the QMS, but has decreased just as dramatically since then. Many of these vessels only fished with tuna longlines for only a short time of the year and many of these vessels did not remain in the fishery for very long. Dr Harley reminded the workshop that historically the domestic CPUE data has been considered unsuitable as a index of abundance for several reasons:

    - the dramatic changes in effort that could lead to changes in catchability, e.g. reduced catchability during periods of high and (effort saturation and competition) low effort (insufficient vessels to find the concentrations of fish);
    - the shift from the competitive catch limit to quotas;
    - the unstable nature of the fleet, e.g. huge changes in the numbers of vessels in the fishery

66. CCSBT-ESC/0609/BGD03 presents an analysis of commercial aerial spotting data for SBT in the Great Australian Bight. There are significant technical challenges and difficulties in interpreting commercial spotting data because of the concentrated searching patterns characteristic of commercial spotting, temporal shifts where spotting occurred and the nature of the data recorded. The problems and dangers of relying on such indices of abundance are well known. CCSBT-ESC/0609/BGD03 shows that the historical commercial spotting data are not likely to yield an age or size-specific index of abundance. The calculated indices were found to be very imprecise and different trends were seen in different indices. CCSBT-ESC/0609/BGD03 also discussed that the interpretation of abundance indices based solely on commercial spotting data will be likely to be highly confounded by the concentrated nature of the searching effort compounded by problems associated with the aerial estimation of biomass.

67. Australia provided a verbal presentation of CCSBT-ESC/0609/19 which described preliminary results from the Indonesian fishery school CPUE index 2001-2006. This index is derived from the observer-like data collected by students training on longline vessels fishing south of Indonesia. Catch rates were presented both as

15

SBT/1000 hooks and the proportion of sets with nonzero SBT catch. Given the uncertain reliability of the data and incomplete understanding of the fishery operations, it was difficult to discern a time trend from either set of indices. The SAG recognized the potential value of further study of the Indonesian spawning ground index.

68. The only other major fleet operating in the SBT fishery in that from Korea, but based on the very low catches in recent years, it was not considered useful to consider developing CPUE for this fleet at this time.

7.2 Conduct any relevant calculations

69. The development of CPUE indices based upon the Taiwan fleet was conducted at the Workshop. These are reported under Agenda Item 3.

7.3 Synthesis and conclusions to forward to ESC

70. Conclusions under this ToR were summarised under three categories based on the portion of the stock that could be monitored. Three categories were: juveniles (ages 1-4), longline vulnerable biomass (ages 5-9), and spawning biomass (ages 10+). The conclusions reached in this section are of direct relevance to ToR 2.

71. Juvenile stock: Fish of these ages are typically poorly selected by the longline fisheries and are predominantly taken in the Australian surface fishery. It was recognised that the nature of the purse seine fishery means that the CPUE (e.g. catch per set) from this fishery is not useful as an index of abundance. Further, it was noted that there were several issues relating to the analysis and interpretation of the commercial spotting data.

72. The partial and convoluted coverage of the GAB by commercial spotting makes it difficult to interpret these data and thus how much effort to devote to their future collection and analysis needs to be carefully prioritised against other more promising approaches to estimating the abundance of recruiting aged SBT in the GAB. This prioritisation could best be done at the SRP review to take place in 2007.

73. Juvenile SBT are taken as by-catch in the Taiwanese albacore fishery in the mid-Indian Ocean and can sometimes comprise up to 30% of the NZ longline fishery catch, so it may be possible to derive indices for these fisheries that provide information on juvenile abundance. In the case of the Taiwanese fishery, special care would be needed given that it is predominantly a bycatch fishery. In particular it will be important to incorporate any target information and appropriately model any observed zeros. In the case of the New Zealand fishery, it was noted that it may not be possible to derive historical indices, and that the interpretation of any indices that area developed will need to consider how abundance in the Tasman Sea relates to the broader stock. Series could be calculated separately for the domestic vessels and for those charter vessels that have carried observers (which is almost all).

74. It was also noted, however, that there are several fishery independent indicators of recruitment, such as estimates of Z from tagging, the GAB aerial survey and the other research programmes undertaken as part of the recruitment monitoring programme such as the trolling monitoring survey in Western Australia. Fishery independent research programmes that are appropriately implemented should provide more reliable data than fishery dependent data (e.g. commercial CPUE) so this should be considered when prioritising resources for monitoring the juvenile stock.

75. Longline vulnerable biomass (intermediate ages): Both the NZ and Taiwanese data may provide useful information for this component of the population, but the same concerns noted above for these fisheries were also relevant here.

76. Spawning age fish: Indonesia is presently the only fleet to fish on or near the spawning ground. It was noted that there were problems in the historical data available from this fishery, but that considerable work was been undertaken to collect better data. Continuation of this work was strongly encouraged and this work may be enhanced by additional scientific initiatives (see discussion on ToR 3). The status of this key part of the SBT stock is the most serious gap in our knowledge of the stock. Further work with Indonesia to develop a viable CPUE series is to be strongly encouraged.

77. It was noted that the current size composition of the catch from the NZ fleet is very similar to that of the Indonesian fishery. Therefore, while noting the concerns raised above about limitations of the NZ data, it may be possible to develop an abundance index for spawning age fish from the NZ fishery.

78. **Summary:** Conclusions from discussions under this ToR are summarised in the table below. The methodological approaches for undertaking the analyses (e.g. aggregated versus shot by shot data were discussed under ToR 2).

Stock component	Potential CPUE indices	Other information
Juvenile	Taiwanese CPUE NZ domestic CPUE Australia commercial aerial spotting	Tagging GAB aerial survey Other recruitment monitoring programmes e.g. trolling monitoring survey
Longline vulnerable	Taiwanese CPUE New Zealand CPUE	Possible sentinel / scientific fishing effort
Spawning aged fish	Indonesian logbook and observer data New Zealand CPUE	Possible sentinel / scientific fishing effort

Agenda Item 8. Provision of any further advice to SAG/SC

8.1 Implications for stock assessment and scientific advice

79. The main recommendations are provided under each agenda item.

8.2 Any reporting implication for /to the Secretariat?

80. There are no reporting implications for the Secretariat at present.

8.3 Need for any further work

81. The workshop served to understand the problems and provide initial solutions to providing a new CPUE series. This needs to be continued with intercessional work building on the collaborations initiated at the workshop.

Agenda Item 9. Report and Closure

82. The report was adopted.

83. The meeting closed at 6:00pm on 25 May 2007.

Linkage of ToRs
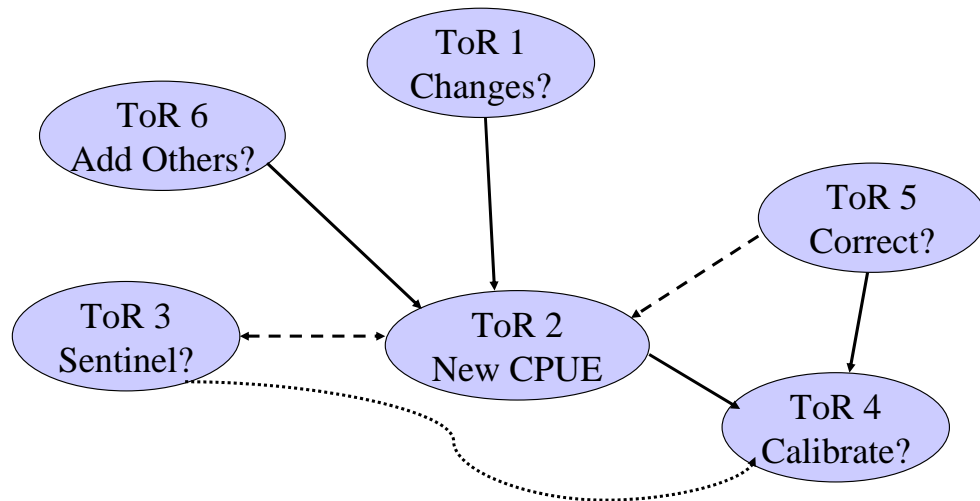
Figure 1.   Linkages of terms of references (ToRs) that were used to guide meeting discussions.
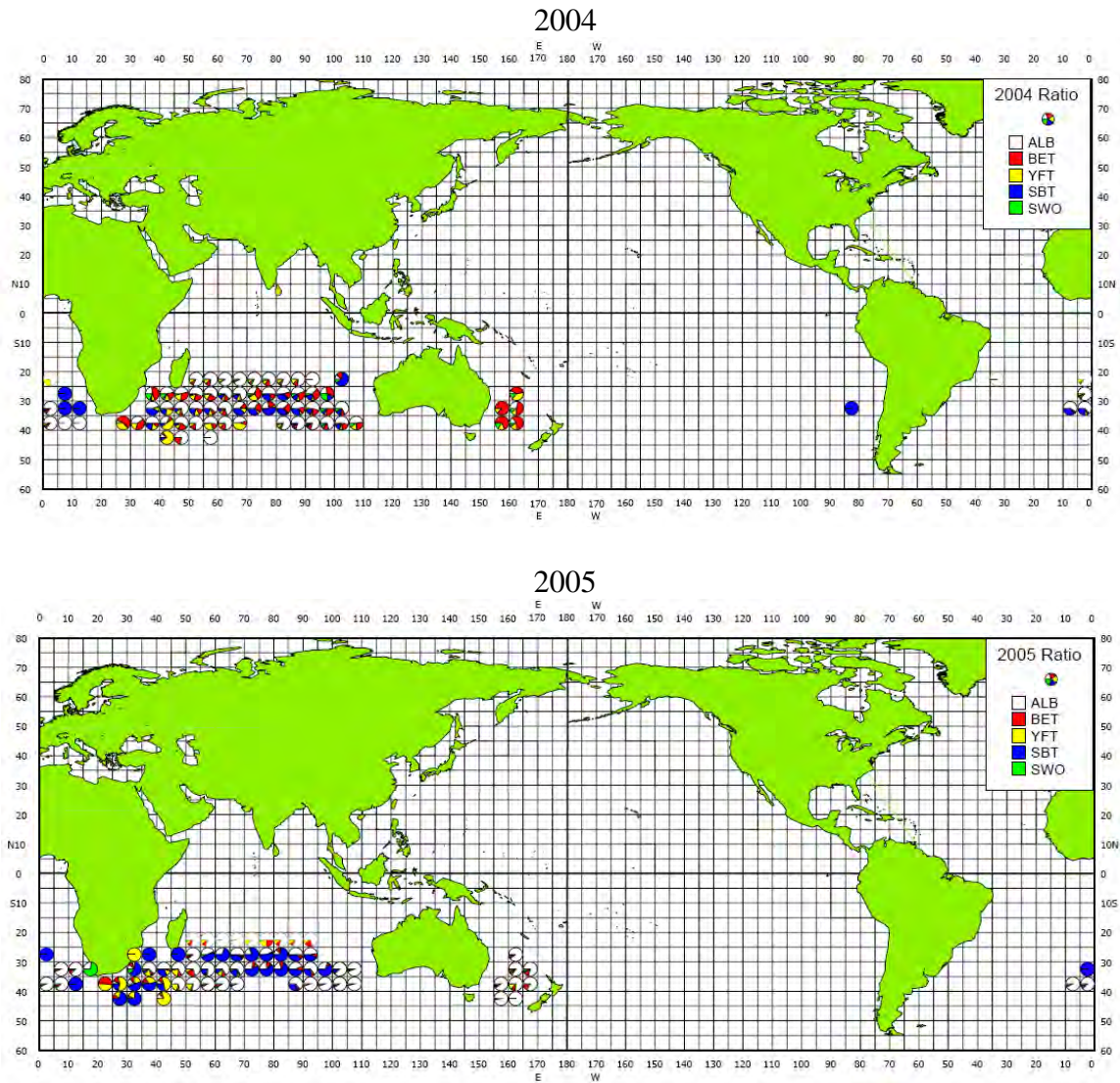
2004

2005

Figure 2.   Catch composition of the Taiwanese fleet in 2004 and 2005.

20

Species Composition of Catch in SBT fishery by Japan
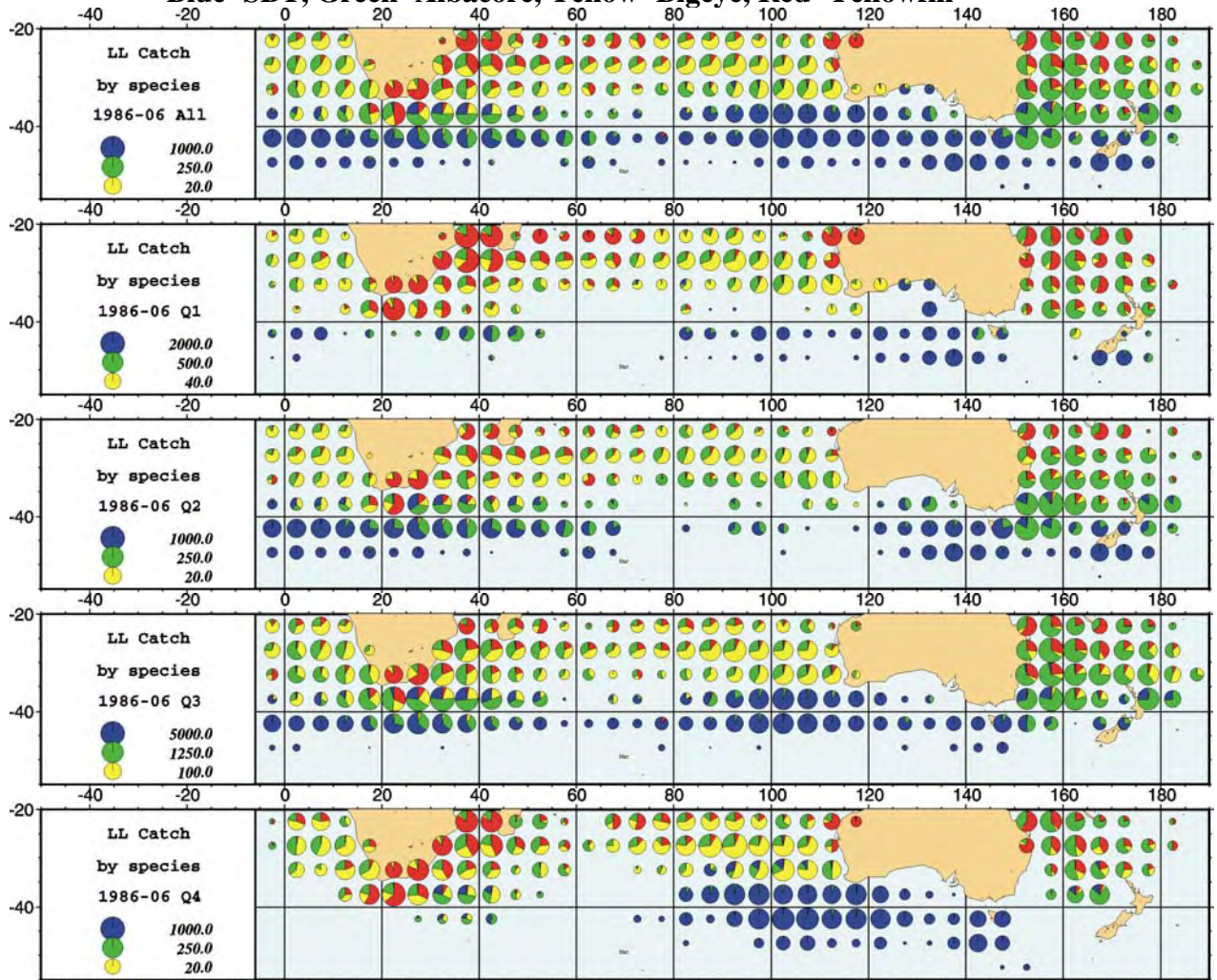### Blue=SBT, Green=Albacore, Yellow=Bigeye, Red=Yellowfin

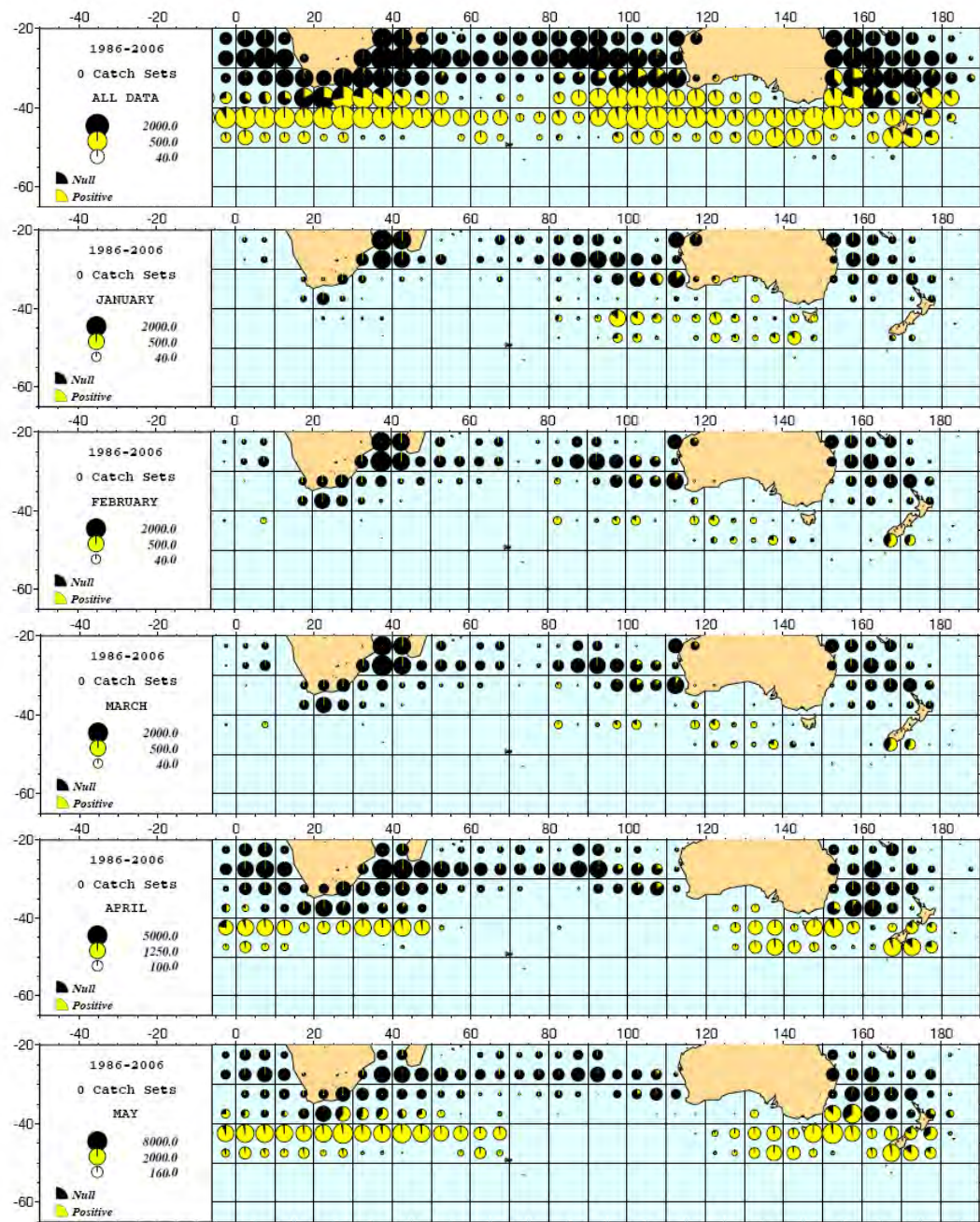Figure 3.   Catch and effort-weighted mean latitude and month based on the 5x5 degree data.

Figure 4. Distribution of null sets (black) and positive sets of SBT over 5x5 areas for selected months.
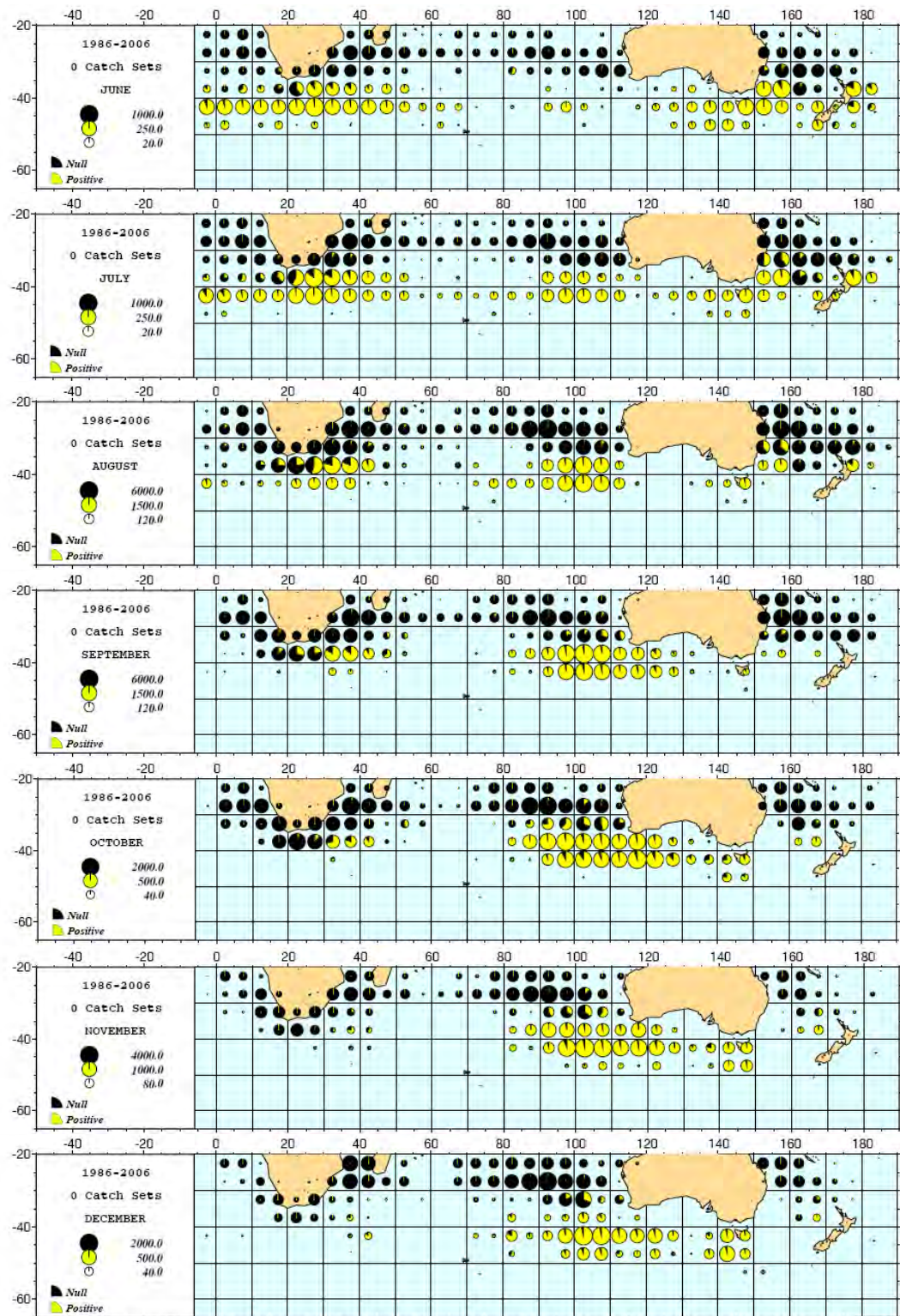
Figure 4. (continued) Distribution of null sets (black) and positive sets of SBT over 5x5 areas for selected months.

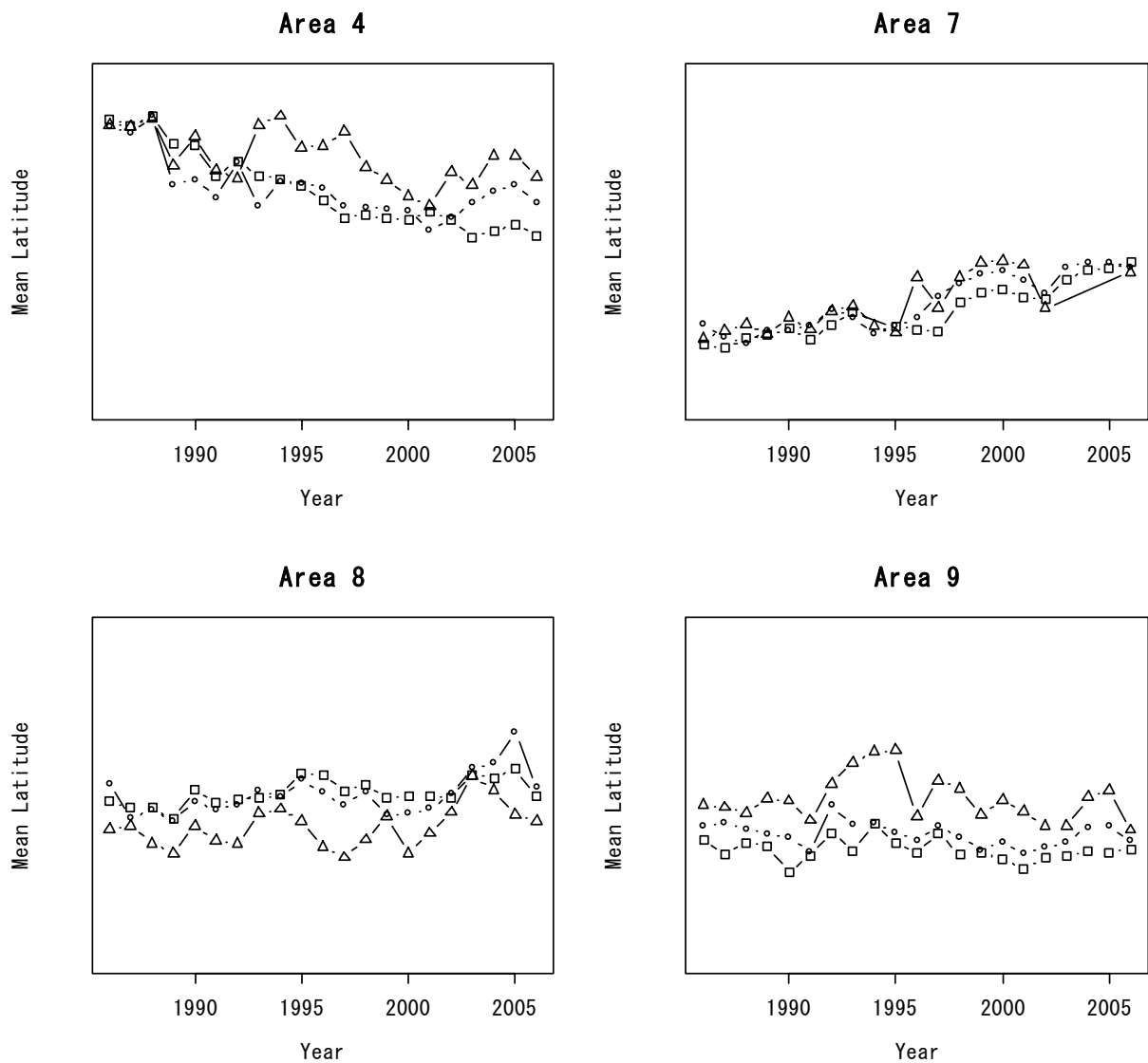## Area 4

Area 7

Area 8

Area 9

Figure 5. Mean latitude by area, month. Data set is based on shot-by-shot. Square, circle and triangle denote May, June and July for Area 4,7,9, and September, October and November for Area 8, respectively. Latitude values on Y axis are not shown due to the data confidentiality reason.
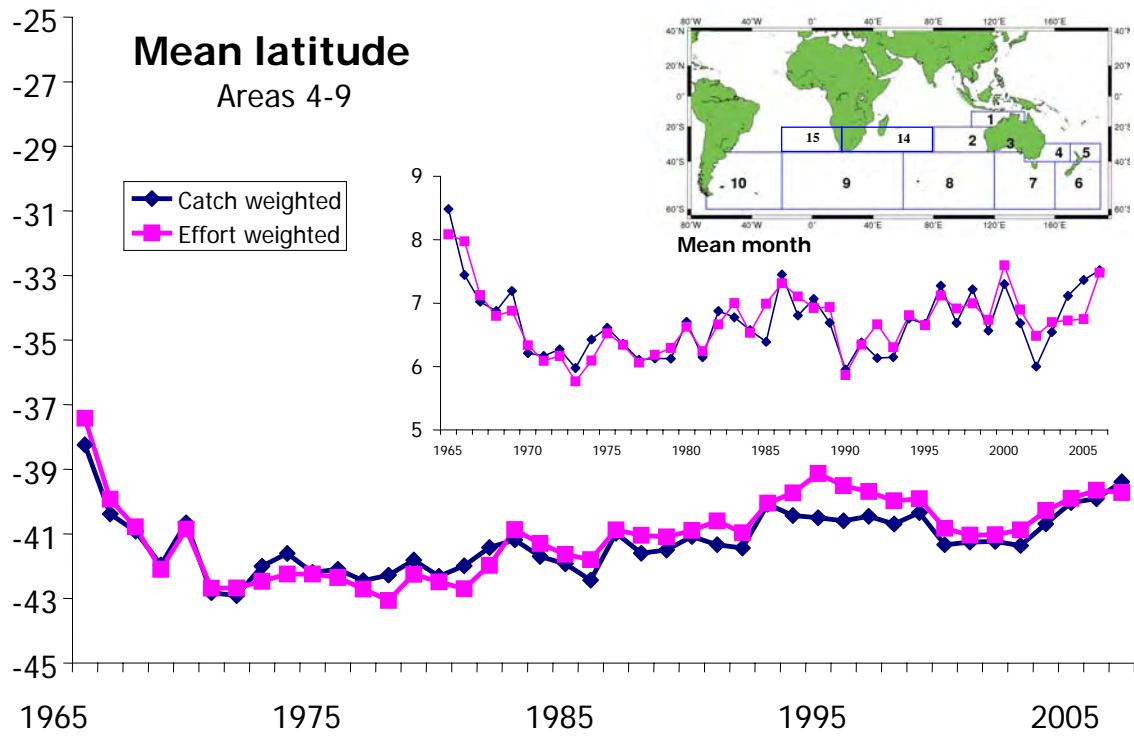
Figure 6.   Catch and effort-weighted mean latitude and month based on the 5x5 degree data.
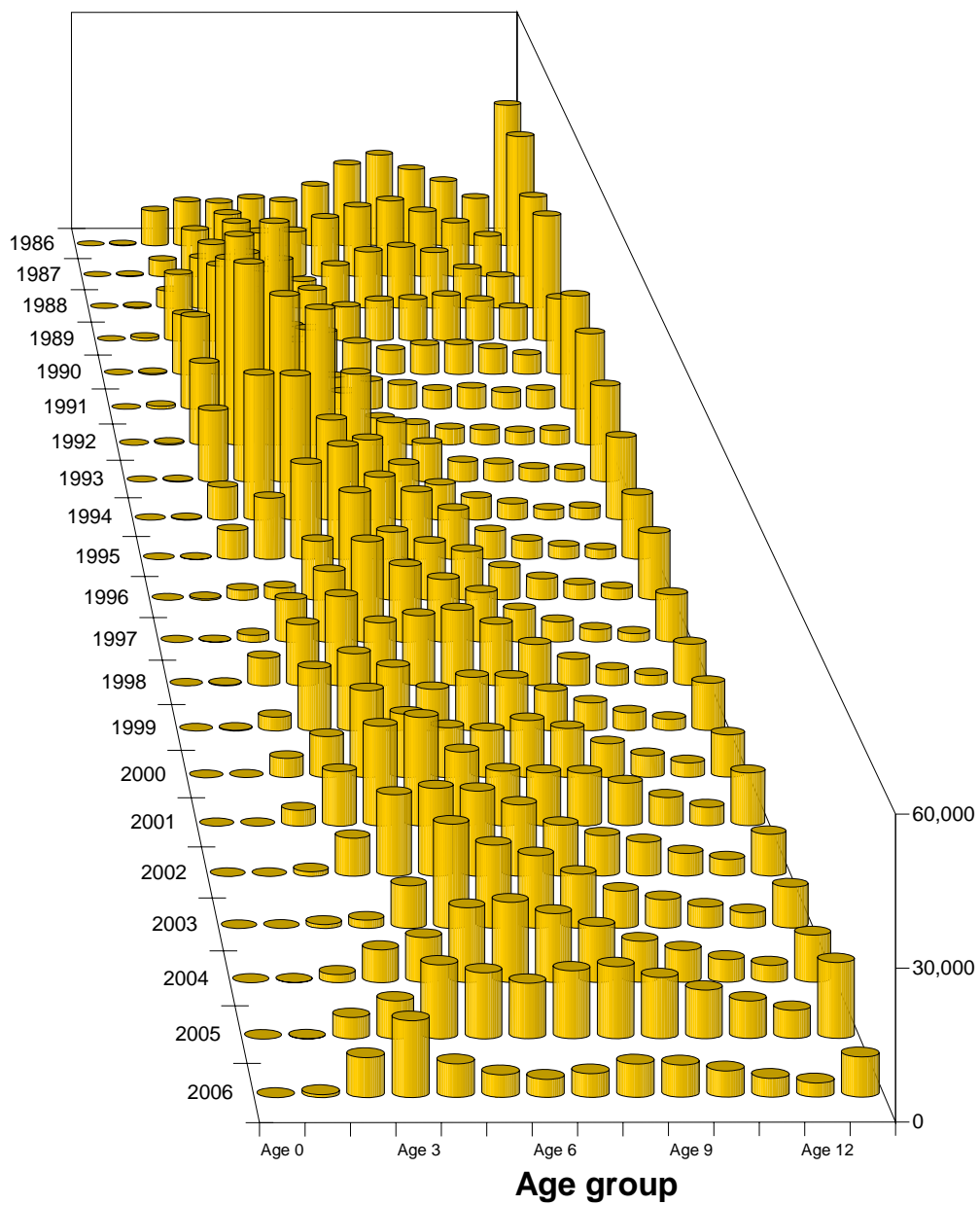
Figure 7.   Summary of the aggregate catch-at-age compiled from the 5x5 database provided by the Commission.
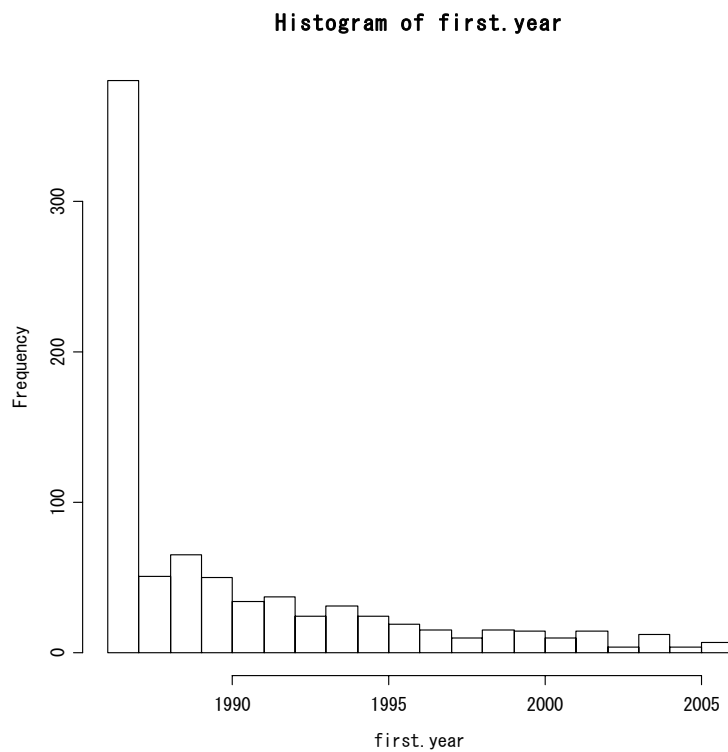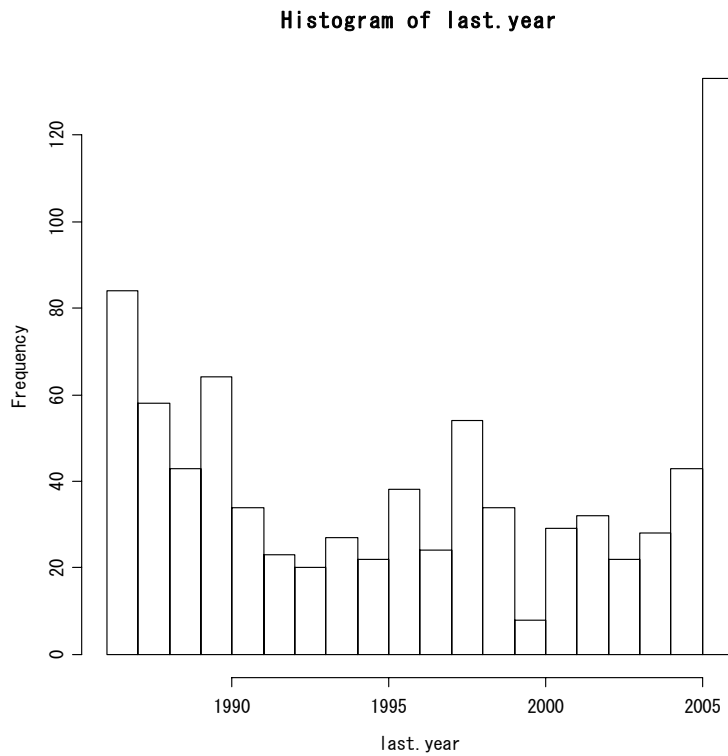
Figure 8.   Pattern of renewal and attrition of vessels in the SBT fleet.
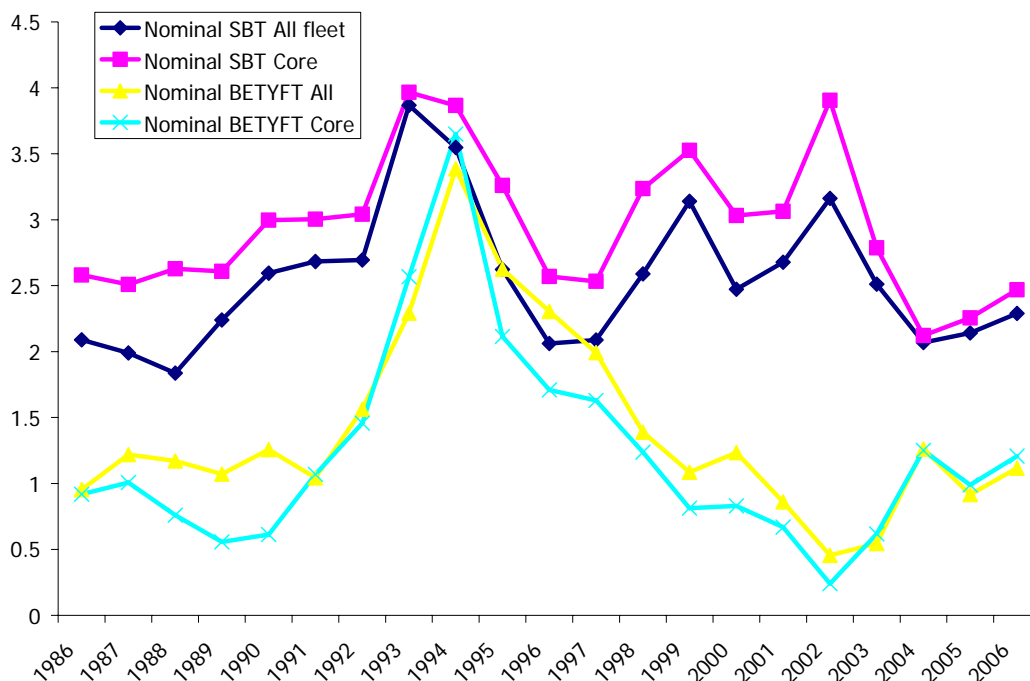
Figure 9.   Nominal SBT CPUE for the entire fleet (based on shot-by-shot data) compared to the core fleet and compared to the nominal catches of yellowfin and bigeye tuna combined.
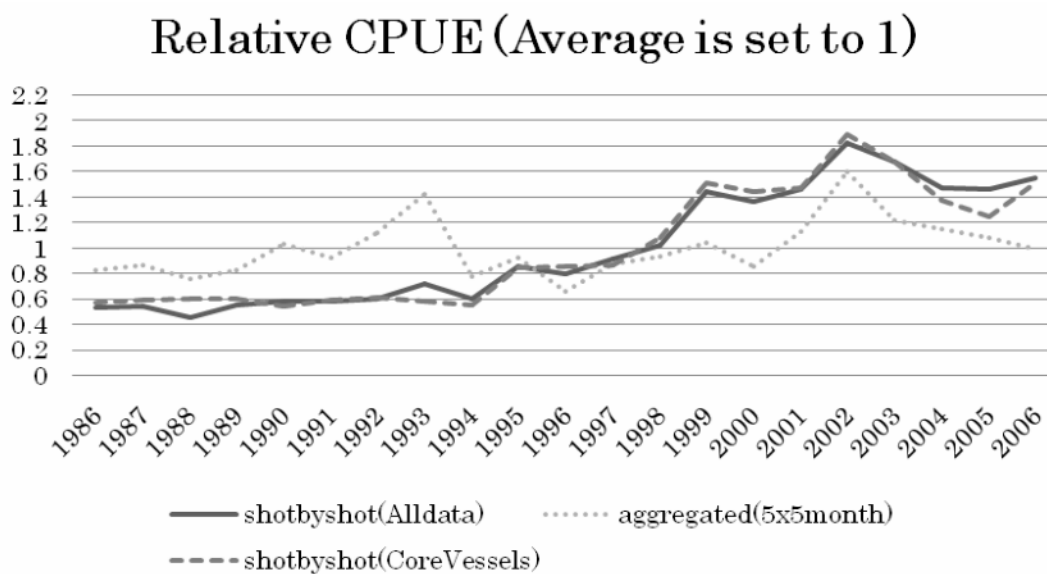

Figure 10.   Comparison of CPUE indices based on aggregated catch and effort data and shot by shot data for all vessels and the core fleet. The analyses for the shot by shot data incorporated information on *vessel* and *hooks per basket*.
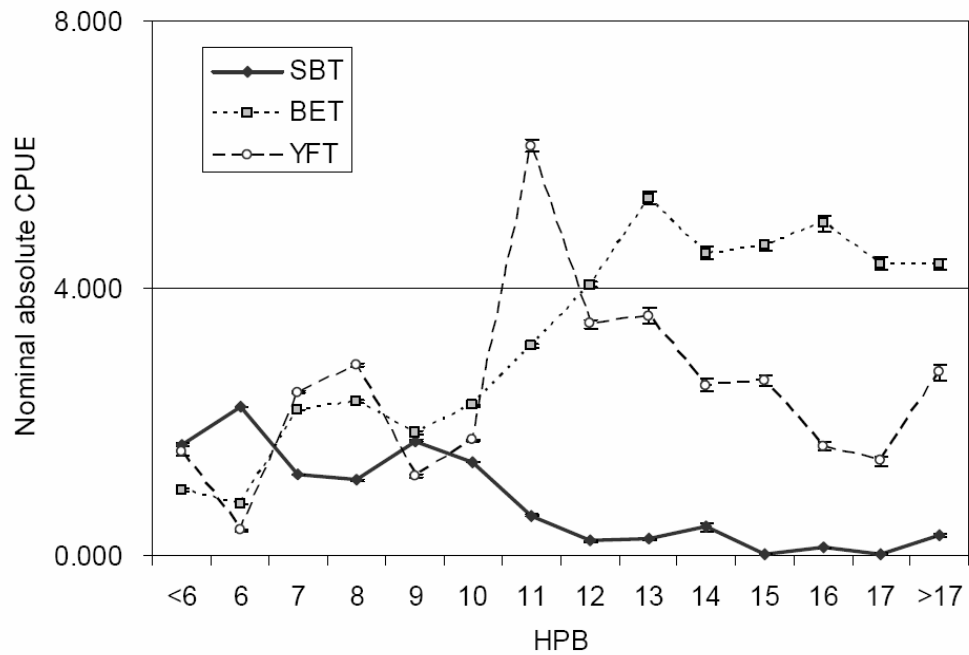
Figure 11.   Nominal CPUE versus hooks-per-basket showing the relationship between fishing strategies targeting different species of tuna.

Dataset-A: Year(1992-2005), Area (4-9), Period=Month(4-9):

Dataset-B: Year (1992-2005), Area (4, 7, 8, 9),
Period=Fishing season(Japanese fishing management zone was open):

Figure 12.   Comparison of model runs with core-vessels and different definitions of areas and times (Datasets A and B).

Figure 13.   Point estimates and confidence bounds from CPUE 06 comparing observer and without observer data.

Figure 14.   Nominal CPUE of three series by area.

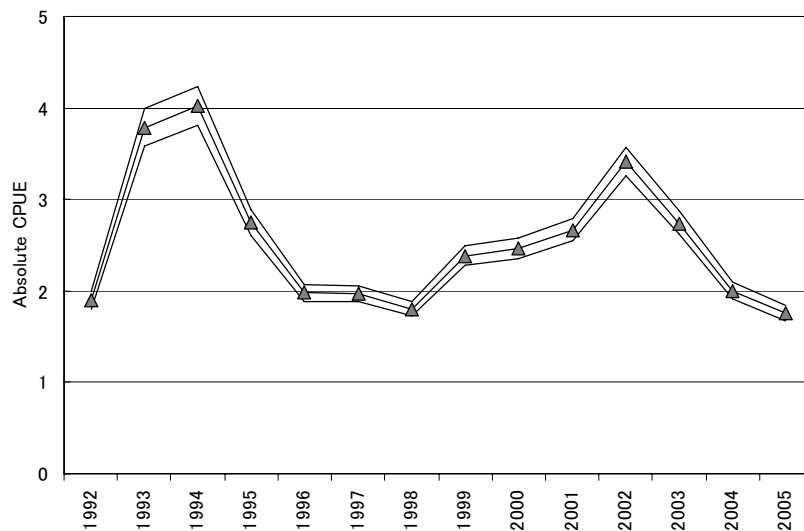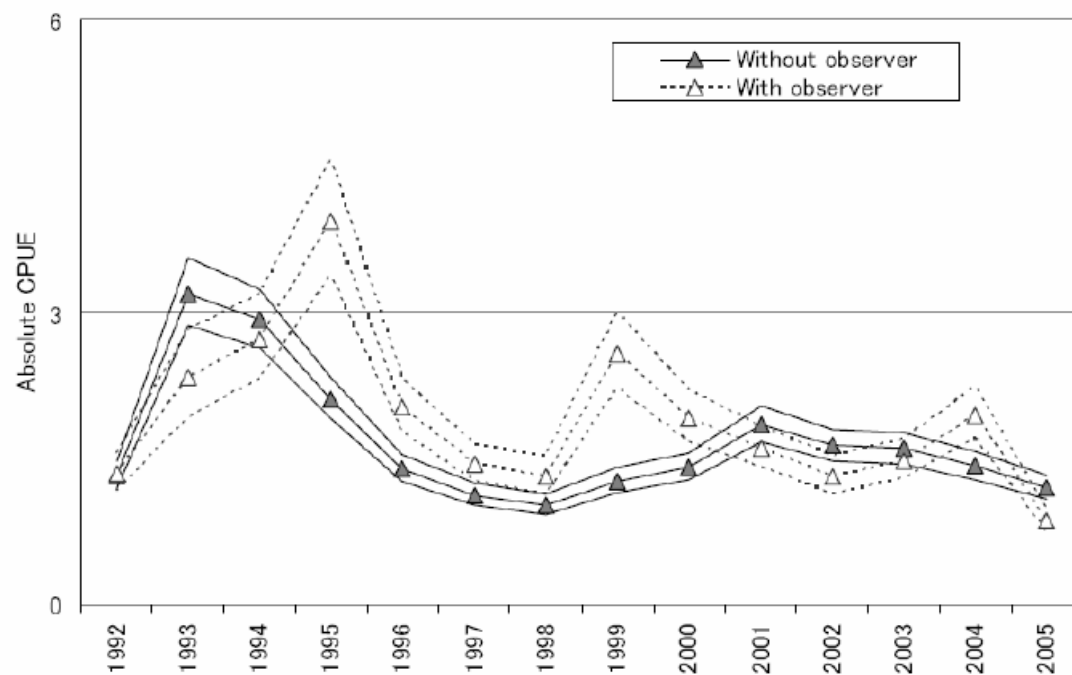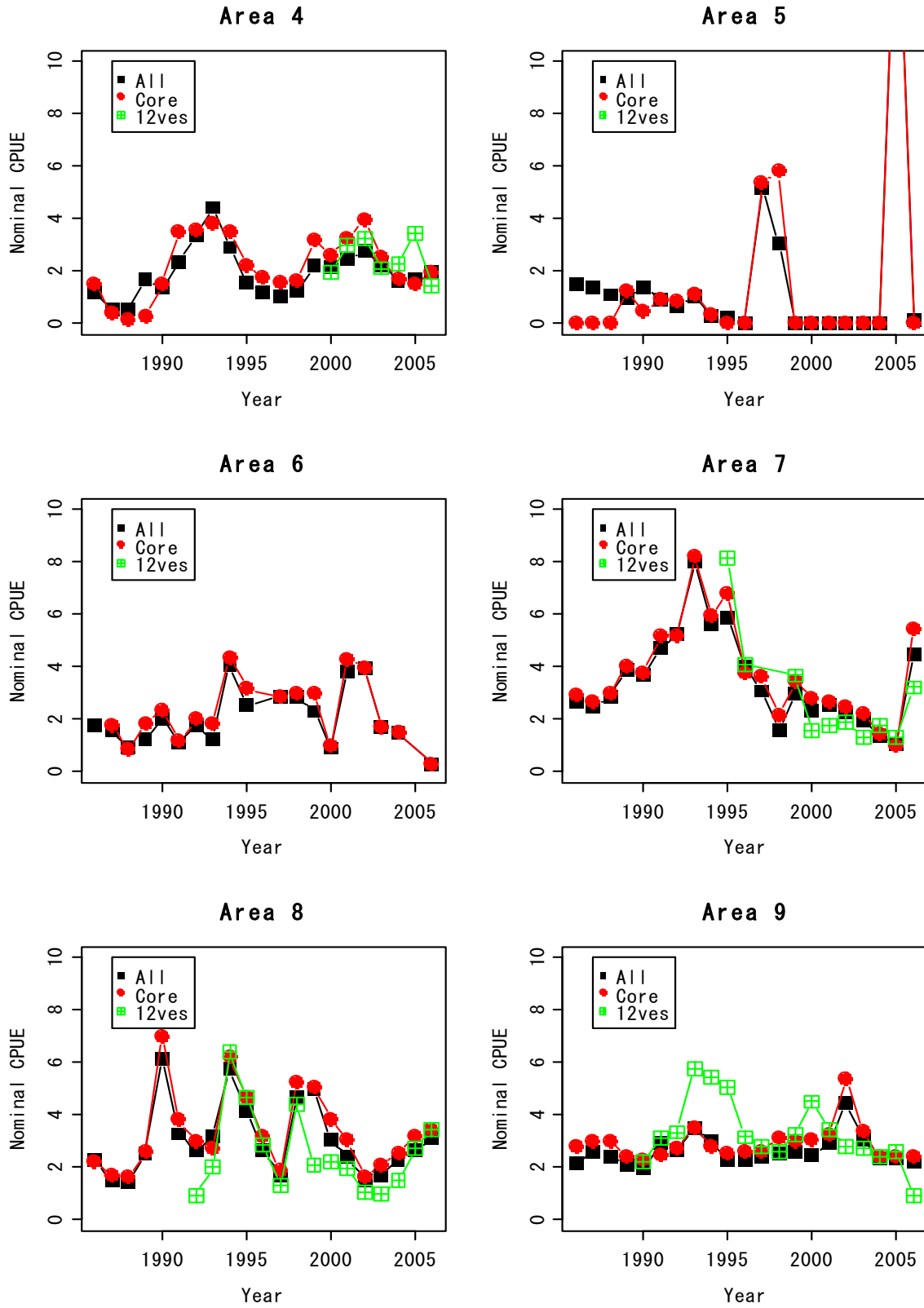Table 1. Summary of core vessel selection results. Shaded columns represent the ratio of the core fleet over the entire fleet. Catch is in thousands of fish, effort in millions of hooks.

	Entire fleet					**"core" selected fleet**								
Year	Vessels	Effort	SBT	Latitude	BETYFT	Vessels	Effort	SBT	Lat	BETYFT	*Vessel.*	*Effort.*	*SBT*	*BETYFT*
1986	268	76	158	-40	72	33	11	27	-40.4	10	12%	14%	17%	0.13
1987	265	76	152	-40	93	38	12	31	-40.6	12	14%	16%	20%	0.13
1988	257	69	127	-39.7	81	43	13	34	-40.5	10	17%	19%	27%	0.12
1989	257	70	156	-40.3	74	55	18	48	-40.9	10	21%	26%	31%	0.14
1990	257	57	148	-40.6	72	67	16	48	-41.2	10	26%	28%	33%	0.14
1991	206	53	143	-40.4	55	63	18	53	-40.6	19	31%	33%	37%	0.34
1992	213	49	133	-38.9	77	64	17	52	-39.2	25	30%	34%	39%	0.32
1993	222	43	166	-38.9	98	74	17	65	-39.1	42	33%	38%	39%	0.43
1994	235	36	129	-38.2	123	83	15	57	-38.7	54	35%	41%	45%	0.44
1995	216	38	100	-38.7	100	80	15	49	-39.2	32	37%	40%	49%	0.32
1996	224	43	89	-39	100	87	18	46	-39.6	30	39%	41%	51%	0.3
1997	216	47	98	-38.9	94	81	20	50	-39.5	32	38%	42%	51%	0.34
1998	221	51	133	-39.2	71	90	23	73	-39.5	28	41%	44%	55%	0.39
1999	189	47	148	-39.9	51	80	22	79	-40.1	18	42%	47%	53%	0.35
2000	178	34	84	-39.7	42	76	17	52	-40.2	14	43%	51%	62%	0.34
2001	186	41	111	-40.5	36	82	20	60	-40.6	13	44%	47%	54%	0.37
2002	157	32	100	-40.3	14	71	15	57	-40.5	3	45%	46%	57%	0.24
2003	158	35	87	-39.7	19	69	15	42	-39.8	9	44%	44%	49%	0.5
2004	151	38	79	-39.2	48	61	16	33	-39.2	20	40%	41%	42%	0.41
2005	160	38	81	-39.3	35	60	15	34	-39.4	15	38%	40%	42%	0.43
2006	127	27	61	-39.3	30	49	11	28	-39.4	14	39%	42%	46%	0.46

List of Attachments

Attachment

1   List of Participants

2   Agenda

3   List of Documents

4   Opening Statements

5   Source code for a typical CPUE model run

List of Participants
Second CPUE Modelling Workshop

CHAIR

Mr John POPE
NRC(Europe) Ltd
The Old Rectory, Staithe Road
Burgh St Peter, Nr Beccles, Suffolk
UK, NR34 0BT
Phone:+44 1502 677377
Fax: +44 1502 677377
Email: popejg@aol.com

Dr Richard HILLARY
Marine Resources Assessment Group
18 Queen Street
LONDON W1J SPN
UNITED KINGDOM
Phone:+ 44 207 594 9330
Email: r.hillary@imperial.ac.uk

ADVISORY PANEL

Dr James IANELLI
Alaska Fish. Science Center, REFM Div.
7600 Sand Point Way NE
Seattle, WA 98115-6349
Phone:+1 206 526 6510
Fax: +1 206 526 6723
Email: jim.ianelli@noaa.gov

FISHING ENTITY OF TAIWAN

Dr Sheng-Ping WANG
Assistant Professor
National Taiwan Ocean University
2 Pei-Ning Road, Keelung 20224
Taiwan
Phone:+886 2 2462 2192 ext 5028
Fax: +886 2 2463 6834
Email: wsp@mail.ntou.edu.tw

AUSTRALIA

Mr Kevin McLOUGHLIN
Fisheries & Marine Science Program
Bureau of Rural Sciences
Dept. of Agriculture, Fisheries & Forestry
Bureau of Rural Sciences
GPO Box 858 Canberra ACT 2601
Phone:+61 2 6272 4015
Fax: +61 2 6272 3882
Email: Kevin.Mcloughlin@brs.gov.au

Dr Chin-Lau KUO
Deputy Director
Economic and Commercial Affairs
Taipei Economic and Cultural
Representative office in Japan
20-2 Shirokanedai 5-chome Minato-ku
Tokyo 108-0071 Japan
Phone:+81 3 3280 7886
Fax: +81 3 3280 7928
Email: clkuo@roc-taiwan.or.jp

JAPAN

Ms Emma LAWRENCE
Fisheries & Marine Science Program
Bureau of Rural Sciences
Dept. of Agriculture, Fisheries & Forestry
Bureau of Rural Sciences
GPO Box 858 Canberra ACT 2601
Phone:+61 2 6271 6364
Fax: +61 2 6272 3882
Email: Emma.Lawrence@brs.gov.au

Dr Naozumi MIYABE
Division chief
National Research Institute
of Far Seas Fisheries
5-7-1 Orido Shimizu-ku
Shizuoka-shi Shizuoka-ken 424-8633
Japan
Phone:+81 54 336 6032
Fax: +81 54 335 9642
Email: miyabe@fra.affrc.go.jp

Dr Tomoyuki ITOH
Senior Researcher
National Research Institute
of Far Seas Fisheries
5-7-1 Orido Shimizu-ku
Shizuoka-shi Shizuoka-ken 424-8633
Japan
Phone:+81 54 336 6033
Fax: +81 54 335 9642
Email: itou@fra.affrc.go.jp

Dr Hiroshi SHONO
National Research Institute
of Far Seas Fisheries
5-7-1 Orido Shimizu-ku
Shizuoka-shi Shizuoka-ken 424-8633
Japan
Phone:+81 54 336 6043
Fax: +81 54 335 9642
Email: hshono@affrc.go.jp

Mr Osamu SAKAI
National Research Institute
of Far Seas Fisheries
5-7-1 Orido Shimizu-ku
Shizuoka-shi Shizuoka-ken 424-8633
Japan
Phone:+81 54 336 6034
Fax: +81 54 335 9642
Email: sakaios@fra.affrc.go.jp

Mr Kiyoshi KATSUYAMA
Director for international negotiation
Fisheries Agency of Japan
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo, 100-8907
Japan
Phone:+81 3 3502 8459
Fax: +81 3 3502 0571

Mr Takaaki SAKAMOTO
Assistant Director
Fisheries Agency of Japan
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo, 100-8907
Japan
Phone:+81 3 3502 8459
Fax: +82 3 3502 0571
Email: takaaki_sakamoto@nm.maff.go.jp

Mr Nozomu MIURA
Manager
International Division
Japan Tuna Fisheries Co-operative Association
31-1, Eitai 2-Chome, Koutou-ku,
Tokyo 135-0034
Phone:+81 3 5646-2382
Fax: +81 3 5646-2652
Email: miura@japantuna.or.jp

NEW ZEALAND

Dr Shelton HARLEY
Principal Scientist
Ministry of Fisheries
PO Box 1020 Wellington
New Zealand
Phone:+64 4 819 4267
Fax: +64 4 819 4261
Email: harleys@fish.govt.nz

INTERPRETERS

Ms Yoshiko SOEDA

Ms Isako YAMAZAKI

Ms Itsuko SAKAI

Agenda
Second CPUE Modelling Workshop
Shimizu, Japan
21 to 25 May 2007

1. **Opening**
   1.1.   Chair welcomes delegates and thanks hosts
   1.2.   Hosts explain working arrangements etc.
   1.3.   Chair gives run down of strategy for the week
   1.4.   Agree Agenda
   1.5.   Appointment of Rapporteurs

2. **ToR 1 Description of any changes in fishing patterns**
   2.1.   Presentation of relevant papers
   2.2.   Conduct any relevant calculations
   2.3.   Synthesis and conclusions to forward to ESC

3. **ToR 2 Analyse past long line CPUE data to best specify one or more robust future CPUE series for high seas components of the SBT stock**
   3.1.   Presentation of relevant papers
   3.2.   Conduct any relevant calculations
   3.3.   Synthesis and conclusions to forward to ESC

4. **ToR 3 Is additional commercial sentinel fishing or scientific effort needed and is this practical?**
   4.1.   Presentation of relevant papers
   4.2.   Conduct any relevant calculations.
   4.3.   Synthesis and conclusions to forward to ESC

5. **ToR 4 Is it possible to calibrate future series to past series?**
   5.1.   Presentation of relevant papers
   5.2.   Conduct any relevant calculations
   5.3.   Synthesis and conclusions to forward to ESC

6. **ToR 5 Is it possible to correct past CPUE series?**
   6.1.   Presentation of relevant papers
   6.2.   Conduct any relevant calculations
   6.3.   Synthesis and conclusions to forward to ESC

7. **ToR 6 Analyse fisheries to try to develop or improve additional indices other than Japanese longline**
   7.1.   Presentation of relevant papers
   7.2.   Conduct any relevant calculations
   7.3.   Synthesis and conclusions to forward to ESC

8. Provision of any further advice to SAG/SC
    8.1.   Implications for stock assessment and scientific advice
    8.2.   Any reporting implication for /to the Secretariat?
    8.3.   Need for any further work

9. Report and Closure
    9.1.   Adopt report
    9.2.   Closure of meeting

List of Documents
Second CPUE Modelling Workshop

(CCSBT-CPUE/0705/)

01. Draft Agenda.

02. List of Participants.

03. Draft List of Documents.

04. (Japan) Preparation and outline of the data for the 2nd CPUE Modelling Workshop. Sakai, O. and Itoh, T.

05. (Japan) Change of operation pattern in Japanese longline fishing for southern bluefin tuna in 2006.   Itoh, T.

06. (Japan) CPUE comparison of Japanese longline vessels between with observer and without observer.   Sakai, O. and Shono, H.

08. (Taiwan) An update of CPUE standardization of southern bluefin tuna caught by Taiwanese longline fishery.

09.   (Japan) Comparison of catch-and-effort data of Japanese longline fishery for southern bluefin tuna between shot-by-shot data and raised data in 5x5 degree and month.   Itoh, T. and Shono, H.

(CCSBT-CPUE/0705/BGD)

01. (Australia) CCSBT 1999.   Australia's revised proposal for a joint experimental fishing program for Southern Bluefin Tuna.   Fourth joint experimental fishing program working group meeting (EFPWG 4) Attachment G.

02. (Australia) 2006. Information and Issues relevant to the plausibility and implications of alternative catch and effort time series for southern bluefin tuna. Polacheck, T., Preece, A. and Hartog, J. (CCSBT-ESC/0609/24).

03. (Australia) 2002. Commercial aerial spotting for southern bluefin tuna in the Great Australian Bight by fishing season 1982-2000. Klaer, N., Cowling, A. and Polacheck, T. (CCSBT-ESC0209/Info-12).

(CCSBT-CPUE/0705/Rep)

01. Report of the CPUE Modelling Workshop (March 2002).

02. Report of the Special Meeting of the Commission (July 2006).

03. Report of the Seventh Stock Assessment Group Meeting (September 2006).

04. Report of the Eleventh Meeting of the Scientific Committee (September 2006).

05. Report of the First Meeting of the Compliance Committee (October 2006).

06. Report of the Thirteenth Annual Meeting of the Commission (October 2006).

Opening statement – Australia

Australia thanked Japan for the invitation to the National Institute for Far Seas Fisheries, Shimizu.

As reported at the special CCSBT meeting in 2006 and CCSBT13, the market review report revealed a substantial overcatch of southern bluefin tuna quota over an extended period. An important task this week is to deal with this overcatch in terms of our ability to assess the status of the stock.

The Japanese longline fleet cpue data is fundamental to current assessments and understanding the impacts of the overcatch on these cpue data is vital to moving forward with the assessment. We need to understand how much of the overcatch came from reported effort over time, how much did not and where the overcatch came from, or how progress can be made with our understanding of this.

Our hope is that this workshop will focus on the scientific process needed for this analysis. Australia agreed to the holding of this workshop in Shimizu with the expectation that visiting scientists would have access to available fine scale data, but we are now faced with this not being the case. Australia requests that this situation be reconsidered in the interests of an open process to move forward. If visiting scientists are not allowed access to these data I fear that any results from this workshop will be called into question and little will be achieved.

Thank you

Source code for a typical CPUE model run

```
*** 2. proc step *** ;
** Note that '*' (i.e. the lines with green characters) shows the comments ;
**  Model through GLM procedure ** ;
proc glm data = shotbyshot ;
   class vesID hpbflag year month area lat5 ;
   model logCPUE = year month area vesID hpbflag / solution ss2 ss3 ; * used for shot-by-
shot data ;
*model logCPUE = year month area / solution ss2 ss3 ; * used for aggregated data ;
   means year ;
   output out=residual p=glmpre r=glmres student=stdresid ;
   lsmeans year area / stderr cl out=estimate ;
   ods output means=nominal ;
*      ods output lsmeans = estim ;
*      ods output predictedvalues = pred ;
run ;
quit ;

proc print data = estimate ;
run ;
quit ;

data CPUEpre ;
   set estimate ;
*   if _name_ = 1 then set temp ;
   lolsmean = lsmean - (stderr*1.96) ;
   uplsmean = lsmean + (stderr*1.96) ;
   cpue_inf = exp(lolsmean) - 0.1 ;
   cpue_pre =   exp(lsmean) - 0.1 ;
   cpue_sup = exp(uplsmean) - 0.1 ;

*   cpue_inf = exp(lolsmean) - 0.2479535 ;
*   cpue_pre =   exp(lsmean) - 0.2479535 ;
*   cpue_sup = exp(uplsmean) - 0.2479535 ;

 run ;
 quit ;

proc print data = CPUEpre ;
run ;
quit ;

proc print data = nominal ;
run ;
quit ;

data CPUEobs ;
   set nominal ;
*   if _name_ = 1 then set temp ;

*   lomeans = Mean_logCPUE - (SD_logCPUE*1.96) ;
*   upmeans = Mean_logCPUE + (SD_logCPUE*1.96) ;

*   cpue_low = exp(Mean_logCPUE - (SD_logCPUE*1.96)) - 0.2479535 ;
*   cpue_obs = exp(Mean_logCPUE) - 0.2479535 ;
*   cpue_upp = exp(Mean_logCPUE + (SD_logCPUE*1.96)) - 0.2479535 ;

   cpue_low = exp(Mean_logCPUE - (SD_logCPUE*1.96)) - 0.1 ;
   cpue_obs = exp(Mean_logCPUE) - 0.1 ;
   cpue_upp = exp(Mean_logCPUE + (SD_logCPUE*1.96)) - 0.1 ;
 run ;
 quit ;
proc print data = CPUEobs ;
run ;
quit ;

* End of the step-2 ;
```