Annex 6

REPORT OF THE ALBACORE WORKING GROUP WORKSHOP

International Scientific Committee for Tuna and Tuna-like Species
in the North Pacific Ocean

14-22 April 2009
Shimizu, Japan

1.0 OPENING OF THE MEETING

A meeting of the *International Scientific Committee for Tunas and Tuna-like Species in the North Pacific (ISC) - Albacore Working Group* (ALBWG) was held at the National Research Institute of Far Seas Fisheries (NRIFSF) in Shimizu, Japan during 14-21 April 2009.

Eighteen (18) participants from Canada, Chinese Taipei, Japan, and United States participated in the meeting (Appendix 1). Ray Conser (Chair, ALBWG) presided over the meeting. A provisional agenda that was circulated prior to the meeting received minor revisions, and was adopted (Appendix 2). Ten working papers and four information papers were presented (Appendix 3). Jon Brodziak, Ray Conser, Momoko Ichinokawa, Mikihiko Kai, Hui-Hua Lee, Yukio Takeuchi, Koji Uosaki and Vidar Wespestad served as rapporteurs.

Dr. H.Honda (NRIFSF) welcomed the ALBWG to Shimizu. He commented on the importance of the North Pacific albacore (NPALB) fisheries to Japan and the key role played by the ISC-ALBWG in assessing the status of the stock, and providing the scientific foundation needed for proper management of NPALB. On behalf of the ALBWG, the Chair thanked Dr. Honda for graciously hosting the meeting and for providing the key technical and administrative support necessary for a successful meeting.

2.0 OVERVIEW AND MEETING OBJECTIVES

The ISC ALBWG has been tasked with completing a new NPALB stock assessment in early 2010. During calendar year 2009, the ALBWG will need to complete all of the data preparations (through 2008) and the preliminary analyses needed to support the new stock assessment. To accomplish these goals, three ALBWG meetings have been scheduled – April (this meeting), July, and October 2009. This meeting (April) focused primarily on the stock assessment modelling – in particular, the transition from the ADAPT-VPA model to the Stock Synthesis (SS) model and consideration of alternative modelling approaches. As is typically the case for ISC WG meetings, other topics were considered on a time-available basis, e.g. reference points and biological research needs – see agenda for the this meeting (Appendix 2).

A brief July meeting (two days in conjunction with the annual ISC Plenary meeting) will update fishery landings statistics and qualitative stock status indicators. The October 2009 meeting will focus on the development of indices of abundance and preparation of the final database needed for the 2010 assessment. Finally, a meeting of the ALBWG in March 2010 will conduct the new stock assessment and report its findings to the ISC Plenary meeting in July 2010.

2.0 RECENT DEVELOPMENTS IN NATIONAL FISHERIES

Only important fishery developments since the July 2008 ALBWG meeting were considered under this agenda item. The annual landings table (typically Table 1 in ALBWG reports) will be updated at the ALBWG meeting in July 2009. With the exception of Section 4, below, all data used for modelling at this meeting reflected the assessment data used in the 2006 ALBWG stock assessment.

V. Wespestad presented **ISC/09/ALBWG/01** on behalf the authors who were unable to participate in this ALBWG meeting. The report documents the catch of albacore in Mexican fisheries. For the first time, Mexico reported the catch of the USA recreational catch in the Mexican EEZ. In general, the Mexican catch of albacore is low and most of the catch is taken incidentally in other fisheries, primarily in purse seine hauls of bluefin tuna destined for pen rearing. Mexico reported no effort data noting that the fishery harvest is very low and has never exceeded 113 t annually.

Discussion

Concern was raised regarding the Mexican report of USA catch in the Mexican EEZ (1998-2007). It was not clear whether these catches were already accounted for in the USA's catch reports to the ISC; or whether these catches have been unreported to date and therefore need be added to the USA reported catch. During the meeting, John Childers (ALBWG database manager) confirmed by email that the catches reported in **ISC/09/ALBWG/01** have indeed been reported as part of the USA catch during all of the years in question (1998-2007).

Z. Zhang presented **ISC/09/ALBWG/08**. The Canadian fishery for albacore tuna in the North Pacific is a troll fishery using tuna jigs. Total catch of albacore by the Canadian troll fishery was estimated to be 5,478 t in 2008, which is a 10% reduction relative to the catch in 2007. The average catch for the period 1995 to 2008 was 4,733 t. All of the 2008 catch occurred in FAO Statistical Area 67. The catch was distributed in the Canadian EEZ (4%), the United States EEZ (87%), and the highseas (9%). The fleet size in 2008 was 133 vessels and is the smallest on record. The fleet has ranged in size from a low of 174 vessels in 2006 to a high of 292 vessels in 1996. Fishing effort in the tuna fishery is measured in number of vessel fishing days (v-d). Fishing vessel days ranged from 4,324 in 1997 to 10,021 in 2001. The fishing effort in 2008 was estimated to be 8,875 vessel days (v-d), which is a 17% reduction relative to the fishing effort in 2007. The estimated CPUE for 2008 is 932 kg/v-d, the second highest estimate on record. The CPUE has ranged from a low of 297 kg/v-d in 1995 to a high of 934 kg/v-d in 2006. Both catch and CPUE are following a long-term increasing trend over the 1995-2008 period. Bycatch by the Canadian troll fishery was negligible in 2008. In 2008, vessels equipped with measuring boards were asked to measure and record in their logbooks the lengths of the first 10 fish landed daily during the 2008 season. Fishers reported 736 fork length measurements. Three modes appear to be present in these length frequency data at 57 cm (3.89 kg), 64 cm (5.50 kg) and 74-75 cm (8.67 kg), corresponding to 2-, 3- and 4-yr old fish, respectively. As in past years, the largest proportion of albacore tuna caught by the Canadian troll fleet are 3-year old fish. Albacore were captured in sea surface temperatures ranging from 11 to 20 °C, but the majority of catch occurred at temperatures between 14 and 19 °C in 2008. Research is in the early stages on investigating patterns of albacore distribution and abundance in response to sea surface temperature.

Discussion

It was noted that while the number of Canadian vessels fishing for albacore declined in recent years, the CPUE has been increasing over the same period. It is thought that less efficient fishermen have tended to leave the fishery in recent years – leaving behind "highliners" who tend to have better CPUE. Since vessel and captain identifiers are recorded in the logbooks, it may be possible to examine this hypothesis through the use of GLM or other CPUE standardization methods.

4.0 DATA AND STRUCTURAL ISSUES REVEALED BY PRELIMINARY MODELLING WORK

Preliminary modeling results – carried out in preparation for this meeting -- prompted examination of the spatially explicit fishery definitions developed by the ALBWG in 2007. Strong seasonal patterns were revealed that may compromise selectivity estimates and catch-per-unit-effort (CPUE) trends for several fisheries. Prior to this meeting, work had been underway to spatially re-stratify the catch, effort, and size data from the Japanese fisheries (surface and longline) in order to improve the fishery definitions.

The fishery definitions used for the preliminary modeling work were based on the ALBWG's previous discussions and recommendations (through the February 2008 ALBWG meeting). The data set was organized as 14 gear and spatially disaggregated fisheries, i.e. 1 Troll; 2 pole and line; 8 longline; 2 gill net; and 1 miscellaneous fisheries -- see Figure 1 for these (old) definition of fisheries. Prior to this meeting, preliminary modeling work (ISC/09-1/ALBWG/05 and Section 5) revealed that current data set prepared for length based SS has several problems with respect to the Japanese pole and line and longline data (see Section 5). The series of working papers ISC/09/ALBWG/2-4 reanalyzed these fisheries data

4.1 Rearrangement of Japanese pole and line and longline fishery data

M. Ichinokawa presented **ISC/09/ALBWG/02; ISC/09/ALBWG/03;** and **ISC/09/ALBWG/04**. These documents reviewed data on catch, effort, and length measurements of NPALB by the Japanese fisheries – offshore longliners, coastal longliners, and pole and line fisheries, respectively. The objective of this review was to explore better spatial and temporal disaggregation of the Japanese fisheries with respect to consistent length selectivity within fisheries. This attribute is quite important for successful application of the length-based SS3 model. Preliminary analysis using the ALBWG agreed fishery definitions revealed some problems such as variability of length frequencies between seasons and highly fluctuated CPUE trends in some fisheries.

This series of documents proposes alternative scenarios for disaggregation of the Japanese fisheries data (i.e. new fishery definitions) and provides preliminary results of the temporal and spatial variability in length composition of albacore catch, and preliminary standardized CPUEs for the newly defined fisheries.

Fork length observed in albacore catch by Japanese offshore longliners has seasonal and spatial variability **(ISC/09/ALBWG/02).** The fork length of albacore catch observed in the north (>25 N) in the first half of the year in the northwest (<180 W) and Dec to May in the northeast Pacific tends to be smaller (mainly from 80 to 90 cm) than those of >100 cm fish observed in the other regions and seasons. Considering these results, further stratification was suggested (Figure. 1). Fishery 8 (F8) was suggested to be separated spatially into 2 regions, and the northern area of the 2 regions was further separated into two fisheries representing the first and second half of the year. F6 was also suggested to be divided into two different seasonal fisheries: (i) December to May and (ii) June to November. Standardized, GLM-based CPUEs corresponding to these newly defined fisheries were also presented. The estimated CPUEs were combined using the area-weighting method.

The seasonal patterns of the length composition of albacore catch by coastal longliners **(ISC/09/ALBWG/03)** are similar with those observed in offshore longliners of F8. Coastal longliners fishing in the first and second quarter in the northwest Pacific (north of 25N) catch relatively small fish with a mode less than 80 cm; while those fishing in the third and fourth quarter, and in the region south of 25N catch larger fish (>100 cm). The separation of F9 into two fisheries (SLL1 and SLL2 – see Table 1) would be reasonable for coastal longline fishery. The fishing season and part of fishing region defined by SLL1, SLL2, and SLL3 overlap fisheries LL8B-1; SLL8B-2/LL8A; and LL7, respectively.

Consequently, the derived CPUEs from the coastal longliners can be comparable with those from the offshore longliners with similar fishing season and area definitions. Two such scenarios were presented: (i) three independent fisheries (SLL1, SLL2, and SLL3); (ii) two fisheries (combination of SLL2 to SLL3 as one fishery, and combination of the coastal fisheries and offshore fisheries with similar length composition, fishing season, and area).

For the Japanese pole and line fishery, spatial variability of the length compositions in albacore catches by latitude is clearly observed **(ISC/09/ALBWG/04).** As such, separation of the overall fishery into three fisheries along latitude bands was indicated (24-29N, 30-34N and 34-44N – named PL1, PL2 and PL3, respectively – see Figure 2). Using these new fishery definitions, the consistency of the length composition by quarter appears to be improved from that seen for the old fishery definitions (F4 and F5, more or less). The three modes observed in length composition of F5 were inherited by PL3, and a single mode can be observed at 80 cm in Qt 2 and Qt 3 in PL1 and PL2. However, the standardized CPUE estimated with GLM including interaction terms of month*year and sub-area*year showed unreasonably large annual fluctuation depending on month and sub-area. Although standardized CPUEs for each fishery (PL1, PL2 and PL3) was calculated after area-weighting, further improvement of the fishery stratification and/or more sophisticated statistical methods (e.g. the delta-method) may rectify the erratic and incompatible trends of CPUE in this fishery.

Discussion

The ALBWG examined the proposals made by these working papers. In particular, the proposal to reorganize some of Japanese offshore longline and pole and fisheries data by season. A concern was raised concerning possible management implications. In particular, the complex fishery definitions (based on both area and season) may cause practical difficulties should managers wish to pursue annual quota or TAC management for NPALB. However since NPALB is currently managed by based on fishing mortality rates and the proposed reorganization of Japanese fisheries is expected to produce more a more reliable assessment, the ALBWG endorsed the idea. Based on the work presented in ISC/09-1/ALB/2-4, the ALBWG recommended modifying the NPALB fishery definitions for the Japanese pole and line and longline fisheries as follows (see details in Table 1):

1. 2 fisheries for PL (from ISC/09-1/ALBWG/04), i.e. dropping PL1 and using only PL2 and PL3.
2. 3 fisheries for offshore LL (Option Iii from **ISC/09-1/ALBWG/02**).
3. 2 fisheries for coastal LL (from **ISC/09-1/ALBWG/03**), i.e. using SLL1 and the combined SLL2 and SLL3.

The WG also discussed the problems of large number of zero albacore catch in the PL CPUE data. The inclusion of a "skipjack catch effect" may help but exploration of an alternative error structure may be more desirable (e.g. one that allows zero catch explicitly). The WG recognized that good progress was made on improving the Japan PL CPUE during this meeting. However, this work was done quickly under difficult time constraints. The ALBWG recommends that the standardization be examined more thoroughly for the October 2009 ALBWG meeting.

4.2 Preliminary revision of Taiwanese longline CPUE

C.-Y. Chen presented **ISC/09/ALBWG/10**. This study examined albacore-targeted CPUE from Taiwanese longline fisheries operating in the North Pacific Ocean. Based on a cluster analysis of the catch composition of Taiwanese longliners, nominal catch statistics can be clearly categorized into two groups. Group 1 comprises those non-albacore-targeting data with an average CPUE of 1.65 alb/1000 hooks, while group 2 comprises those albacore-targeting data with an average CPUE of 32.75 alb/1000 hooks. Group 1 tended to catch fish of slightly larger size, while group 2 caught smaller fish. The

grouping is not only characterized by catch composition and size of fish, but also reflected the fishing intention of the longline fleets. Most of the fishing effort of group 1 was contributed by fishing vessels operating with more than 15 hooks/basket, while group 2 mainly fished 9-13 hooks/basket. Around 80% of fishing effort of group 1 was distributed in the waters of 0°-10° Lat. N., and most of fishing effort of group 2 was located in the waters of 25°-40° Lat. N. It is also revealed that the increasing effort since 2001 was mainly contributed by the non-albacore-targeting vessels, and it is suggested that extracting albacore-targeting catch statistics is necessary prior to the standardization of albacore CPUE in the North Pacific Ocean.

Discussion

The ALBWG discussed which CPUE series should be used for the Taiwanese longline fishery. The author indicated that he will revise the clustering analysis prior to the October 2009 ALBWG meeting. Additional data will be incorporated, i.e. 2007 data and 2008 data (if available). The author also indicated he intends to build a discriminant function using the Taiwanese set-by-set data. When completed, this should alleviate the need to re-do the cluster analysis each time a new year of data becomes available. He also indicated that he will standardize the CPUE accounting for the effects of area and season. The ALBWG also discussed the geographical boundary between the North and South Pacific for the purpose of NPALB assessment. It was pointed out in the case of Japanese longline fishery, 10N latitude was used. Consequently the ALBWG agreed to allow each fishery to establish its natural latitudinal boundary. However, for comparison with JLL indices and previously developed TLL indices, it is recommended that the area between the equator and 10N be used as an area effect in the GLM.

Finally, it was also noted that during this meeting, the ALBWG made substantial modifications and reorganized the Japanese longline and pole and line fisheries. Taiwan also presented preliminary reanalysis of their longline CPUE focusing on the importance of developing a discriminant function for albacore targeting and non-targeted sets. The ALBWG noted similar work is necessary for US/Canadian troll and US longline CPUEs before the ALBWG meeting in October 2009.

Table 1. Summary of fishery definitions for Japanese longline and pole and line fisheries for applying length-based integrated model. The effort and catch data of offshore longline of Fisheries 6, 7, and 8 (F6-F8) are derived from 'AOCEAN' (the data set where set-by-set log book of commercial vessels have been raised by the actual 5x5 degree catch), while the effort and catch data for coastal longline of SLL1-SLL3 and pole and line of PL1-PL3 were derived from original set-by-set data, not raised by catch.

Oritinal fisheries	New definition	Spatial and temporal range	Area size *1	Target length	Average number of hooks or poles per year ($x10^6$)			Average number of albacore catch per year (x1000 inds)			Assined Fisheries in new definition
					1952-1965	1966-1990	1990-2005	1952-1965	1966-1990	1990-2005	
Japanese offshore longline											
F6	LL6A	Dec to April	36	around 90cm	4	11	7	23	129	134	F6
	LL6B	May to Nov	48	>100cm	6	5	3	18	48	22	F7
F7	LL7	All season	72	>100cm	23	40	27	29	76	125	F7
F8	LL8A	25-30N, 140-180W	8	>100cm	16	17	9	275	143	49	F7
	LL8B-1	1st and 2nd qt.	35	Around 80cm	39	16	13	581	186	74	F8
	LL8B-2	3rd and 4th	35	Around 100 cm	30	31	21	196	159	171	F7
Japanese coastal longline											
F9	SLL1	1st and 2nd qt.	17	Around 80cm	-	-	16	-	-	397	F9
	SLL2	3rd and 4th	17	90-100 cm	-	-	15.5	-	-	108	F10
F10	SLL3	All season	22	around 100 cm	-	-	12.3	-	-	141	F10
Japanese pole and line											
F4 and F5	PL1	24-29N, 130-179W	10	80-90 cm	-	0.04	0.01	-	6	2	F4
	PL2	30-34N, 130-179W	10	70-80 cm	-	0.20	0.05	-	75	41	F4
	PL3	35-44N, 140-179W	16	50-80 cm	-	0.19	0.13	-	99	126	F5

*1; area size is the number of 5x5 blocks with fishing efforts in the defined region.

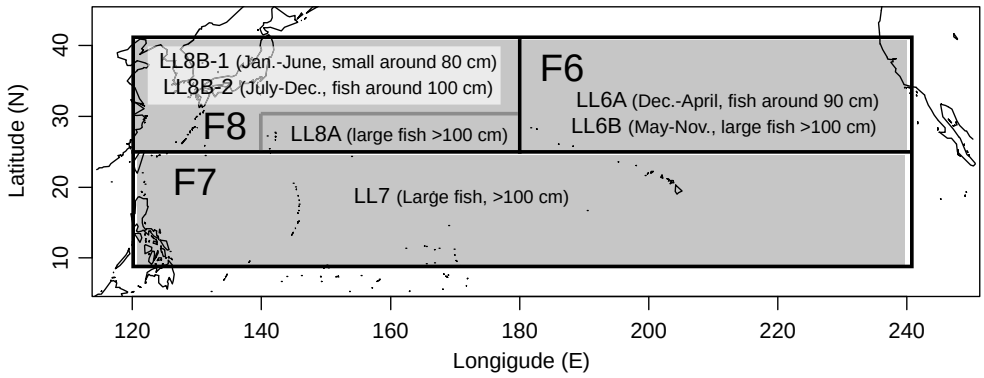

Figure. 1. Old Japanese offshore longline fisheries (F6 to F8) and the new fishery definitions (LL6A to LL8B-2).

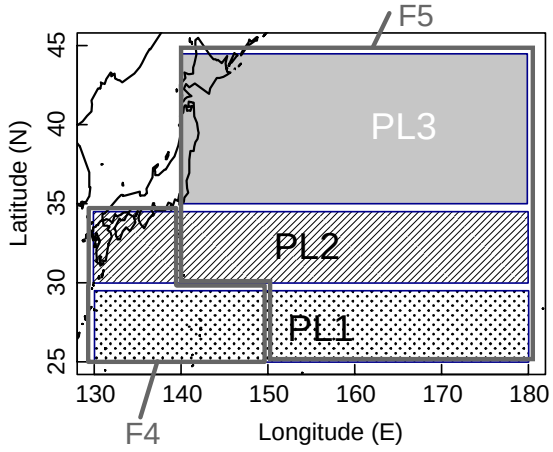

Figure. 2. Old Japanese pole and line fisheries (F4 to F5) and the new fishery definitions PL1 to PL3.

5.0 PROGRESS ON LENGTH-BASED SS3 MODELLING USING DATA FROM THE 2006 STOCK ASSESSMENT

Age-based SS2 modeling was the focus on the March 2008 ALBWG meeting. Length-based modelling (i.e. using catch-at-size as input) is desirable for the 2010 stock assessment. To this end, work has been underway on SS3 length-based modeling. Progress is reviewed in this section.

5.1 Summary of the work carried out prior to this ALBWG meeting

H.-H. Lee presented **ISC/09/ALBWG/05.** The purpose of this paper is to give a brief introduction of data used in the baseline model and elucidate the current data lack-of-fit. Diagnosis of model fitting to CPUE and length-composition data was examined by comparing expected values from the model with the actual observations. First of all, the model was not able to fit all indices due to conflicting trend of some CPUE. The selection of what CPUE is fitting was made based on what CPUE was expected to best represent the true abundance trend. For example, one of series for the Japan pole-and-line was eliminated since the other series for Japan pole-and-line is more likely to represent juvenile albacore. In addition, one of series for the Japan large longline (fishery 7) shows an unrealistic trend which dramatically increases 10 times within 5 years. Therefore, the other large longline series (fishery 6 and 8) are more plausible to represent adult albacore than the fishery 7. In summary, USA troll (fishery 1) and Japan pole-and-line (fishery 5) were fitted into model to represent juvenile albacore. The longline series for fishery 6 and 8 were used to represent adult albacore and the small longline for the fishery 9 was selected to represent adult albacore in recent years showing compatible trend with large longline.

However, the model was also not able to capture trends in the fitted selected indices. It seems that there is confounding among length-composition data from CPUE data when both data components are included in the model. After down-weighting length-composition data ($\lambda = 0.1$), model can capture trend in the fitted Japan large longline (fishery 8) although model still showed lack-of-fit with respect to CPUE. Accordingly, putting stronger weighting on the fitted indices showed better fit on the longline fishery 8. The model was able to fit the length composition by internal estimating growth parameters. There might be some seasonal and spatial variability among the length composition data resulting in the lack-of-fit with respect to CPUE for some strata, especially for pole-and-line older fish catch (fishery 5) and longline younger fish catch (fishery 6, 8 and fishery 9).

M. Kai presented **ISC/09/ALBWG/06.** A new scenario was presented in this working paper to investigate the influences of the changing the area-aggregation of Japanese main fisheries (Pole and Line, longline-large and longline small) on the results of the Stock Synthesis model. Catch, CPUE and length composition data by each fishery were combined into one single time series. The parameterization and the model configurations were based on the base case scenario proposed by **ISC/09/ALBWG/05**. The results from new scenario were compared to the results from the base-case. Additional test runs were conducted to investigate the influence of the change in bin structure as well as initial equilibrium catch. Under the new scenario, a reasonable result on the trends and scaling of the SSB was obtained. However, the structure of this scenario was not robust to the change in the initial values of the parameters and the bin structure. Neither the new nor base-case scenarios fit well for the length composition data and some CPUE data. Therefore, further study and discussion is necessary to decide the best way to obtain reasonable results for stock assessment.

5.2 Summary of the work carried out during this ALBWG meeting

As discussed, above, and detailed in the working paper summaries, considerable research effort prior to this ALBWG meeting was focused on the application of length-based SS3 to NPALB. These efforts served as a launching board for the additional work that was carried out during this ALBWG meeting. The foci of these efforts and their implications for the next NPALB assessment (March 2010) are outlined below.

SS3 modeling focused on runs using the new Japanese fishery definitions. Unreasonable high biomass was estimated whenever the model was allowed to estimate the growth parameters. Subsequently, the growth parameters were fixed (Suda 1966), and this resolved the scaling problem. The model fit the offshore and coastal longline length frequency data well, although there was some lack-of-fit for the pole-and-line fishery and for the USA troll fishery.

Scores of SS3 sensitivity and test runs were made during the meeting using the new fishery definitions and fixed growth (Section 4). Of these runs, a base case was established (Table 2) that provided reasonable results. A series of eight sensitivity runs – established about the base case – demonstrated that the base model was reasonably stable. A set of additional sensitivity runs to be conducted after this meeting were identified as well as a new candidate base case for future work.

Table 2. Characteristics of the SS3 model configuration for the base case considered at this ALBWG meeting; the range of sensitivity cases examined; runs to consider in future work; and suggested future base case for further examination.

BASE CASE

(i) Set M=0.3 and fix growth rates at Suda pars
(ii) Set CV=0.10 for length at max age; set CV=0.08 for length at min age
(iii) Set h=1 (steepness) to better correspond with the 2006 assessment
(iv) Use more aggregate binning for large fish: /1cm 26-90cm / 2cm 90-100cm / 4cm >100cm/
(v) Use separate binning structure for the population /1cm 10-140cm/
(vi) Use only 1 surface (Fishery 1) & 1 LL (Fishery 7) in setting equil catch & for estimating equil F
(vii) Use n=10 as input eff sample size (all fisheries/all years); do not use variance adj on size

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SENSITIVITY RUNS

(viii) Set M=0.30 and estimate growth in SS3
(ix) Set M=0.23 and fix growth at Suda pars
(x) Use n=5,25,50 as input eff sample size (all fisheries/all years); do not use var adj on size
(xi) Use only 1 surface (Fishery 5) & 1 LL fishery (Fishery 7) in setting equil catch and est equil F
(xii) Use only 1 surface (Fishery 1) & 1 LL fishery (Fishery 8) in setting equil catch and est equil F
(xiii) For all dome-shaped LL fisheries, estimate selex for largest size bin (basecase fixed at zero)
(xiv) Set h=0.75

SUGGESTED RUNS TO CONSIDER AFTER THIS MEETING

(xv) Use dummy fishery for equil period with
  a. selex fixed similar to VPA aggregate selex for mid-1960s
  b. catch set to the best total catch estimate for the pre-1966 period
(xvi) To ensure that size comps do not dominate & (at least some) CPUE indices are influential
  a. Do trial run with variance adjustment factor turned on
  a. Based on trial run, develop relative input n that accounts for decadal changes in effective sample size and proper relative weighting among fisheries
  b. Then do all further runs using these input n's and with variance adjustment factor turned off
(xvii) Use more aggregate binning for samples : 2cm 26-100cm / 4cm >100cm
(xviii) To reduce the overall number of bins, use separate sample binning structure for each fishery
(xix) Many fisheries are seasonal – delete their length composition or set eff sample size n=1 for fishery/seasons with small catch. Will need table of seasonal catch & size samples by fishery

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SUGGESTED NEW BASE CASE FOR FUTURE EXAMINATION[1]:

(xx) Set M=0.3 and fix growth rates at Suda pars
(xxi) Set CV=0.10 for length at max age; set CV=0.08 for length at min age
(xxii) Set h=1 (steepness) to better correspond with the 2006 assessment
(xxiii) Use more aggregate binning for large fish: /1cm 26-90cm / 2cm 90-100cm / 4cm >100cm/
(xxiv) Use separate binning structure for the population /1cm 10-140cm/
(xxv) Use only 1 surface (Fishery 5) & 1 LL (Fishery 8) in setting equil catch & for estimating equil F
(xxvi) Use n=10 as input eff sample size (all fisheries/all years); do not use variance adj on size
(xxvii) For all dome-shaped LL fisheries, estimate selex for largest size bin (basecase fixed at zero)

[1] The WG recognizes that current fishery definitions and/or data may be reexamined during the period leading up to the October ALBWG meeting. Further, three additional years of data will become available. These new analyses and data may lead to different definitions of fisheries that improve model fits and performance. Other characteristics may also warrant revision. However, great care should be taken in making such changes so as not to negate the modelling progress from this meeting.

6.0 ALTERNATIVE MODELLING APPROACHES

At its July 2008 meeting, the ALBWG agreed (on a time available basis) to consider an alternative model (to SS3) developed by Martell et al. (2008). Unfortunately, it was not possible to complete the work prior to this meeting. However, the modelling should be presented at the October 2009 ALBWG meeting.

Z. Zhang presented **ISC/09/ALBWG/09.** The paper evaluated the accuracy and reliability of stock synthesis models fitted to simulated catch data using three alternative error distributions, normal, lognormal, and multinomial. They used published population parameter values and fishing mortality rates presented by Kimura (1996) to generate simulated catch-at-age data and fishing effort data. Bias of the estimation was examined by fitting a stock synthesis model to the generated data sets in a Bayesian fashion.

Consequences of using normal, lognormal or multinomial distribution to fitting the models rely on the amount of information used in the modeling. When age selectivity to the fishing gear was known, all estimators, in general, performed well with relatively small biases and low variances in errors, although the multinomial distribution performed more poorly than lognormal or normal distribution. When age selectivity was unknown, different distributions produce rather different outcomes. When age selectivity was to be individually estimated from the model, application of the commonly used log-normal distribution would likely greatly over-estimate the recruitment and biomass.

It was found that trends of relative abundances were better captured by using the normal distribution than using the lognormal or multinomial distribution in this case. In general, it appears that the normal distribution outperformed the other two distributions, although it is not usually used in the age-based structured models; but, when the age selectivity is unknown, models could be sensitive to the data. Variances were often higher for the most recent few years than for the earlier years.

Discussion

During discussions it was pointed out that high variance means a greater chance that recruitment and biomass to be erroneously estimated, even in cases where bias is small. The results indicate that population projections start a few years prior to the end of the time period to avoid the imprecision that could result from errors from misspecified distributions.

7.0 DECISIONS REGARDING MODELLING FOR THE 2010 ASSESSMENT

7.1 Overview

R. Conser presented an overview on the recent history of stock assessment methods that have been used for NPALB and Yukio Takeuchi presented a primer on the Stock Synthesis (Methot 2007) model.

The ADAPT-VPA statistical model has been used for NPALB assessments for more than ten years (Conser 1991; Porch 2003). ADAPT-VPA is a parsimonious model that is relatively straightforward to use. It runs quickly, allowing the use of computationally intensive statistical methods for estimating uncertainty, e.g., nonparametric bootstrap methods. However, ADAPT-VPA requires estimates of catch-at-age (CAA) as input data. While CAA data are readily available for many fisheries with production age-reading programs (e.g., groundfish and small pelagics), CAA, based on annual hard-part ageing, are not available for NPALB or most other tunas. In previous assessments, CAA for NPALB has been estimated by transforming the catch-at-length (CAL) data into CAA using two methods: (i) modal progression for juveniles and (ii) the Multifan method for adults. In both cases, NPALB growth rates

were assumed to be those estimated by Suda (1966). For adults, this is strictly the case but for juveniles, Suda growth is merely used as guidance for the modal progression analysis.

The ALBWG has recognized for some time that it would be desirable to have an assessment method for NPALB that takes CAL as input (rather than CAA). Such assessment methods have been examined including a multi-year exploratory effort using Multifan-CL (Fournier et al. 1990) with the NPALB data. Over the past two years, Stock Synthesis v2 (SS2) has been explored -- primarily the age-based version which also requires CAA – as a transition from the ADAPT-VPA to the length-based SS2 (which takes CAL as input). This transition process was the focus of the ALBWG meeting held in March 2008. The work from that meeting showed that when configured similarly, age-based SS and ADAPT-VPA models produce generally similar results. Following the March 2008 meeting, members of the ALBWG focused on the applying the length-based SS2 model.

Stock Synthesis v3 (SS3) was released in February 2009. SS3 has new features that may be useful for the next NPALB assessment, e.g. ability to handle more general size frequency categories; more flexible natural mortality function; etc. The software and source code and freely available at http://nft.nefsc.noaa.gov/. In preparation for this meeting, members of the ALBWG have examined the performance of length-based SS3 using the NPALB data from the 2006 stock assessment (**ISC/09/ALBWG/05** and **ISC/09/ALBWG/06**).

7.2 ALBWG Decisions on Modelling

After examination of scores of exploratory SS3 runs (see details in Section 5); followed by extended discussion, the ALBWG reached consensus on the following five modelling decisions.

(i) SS3 has many new features that should prove useful for NPALB assessment. Furthermore, developer support for the earlier version of SS (SS2) will likely be minimal by the time the 2010 NPALB assessment is conducted. The ALBWG should use the new version of SS (SS3) for all further SS modelling.

(ii) Length-based SS3 is a natural choice for NPALB assessment (over age-based SS3) in that its basic catch input is based on size composition rather than age composition. The SS results from the March 2008 ALBWG meeting coupled with those from this meeting (Section 5) support carrying out all further SS modelling using the length-based SS3 approach.

(iii) While further refinement of the SS3 modelling is likely, preliminary SS3 modelling results using data from the 2006 assessment (Section 5) were promising and sufficiently well-behaved to justify using SS3 for the 2010 assessment.

(iv) To ensure a smooth transition from the 2006 assessment, the ADAPT-VPA model should be used in conjunction with SS3 for the 2010 stock assessment. In addition to the data preparations needed for the SS3 modelling, three additional years of CAA (2006-08) will be required for all fisheries. It is anticipated, however, that additional work on CPUE will not be necessary. The CPUE indices developed for use with SS3 can also be used with ADAPT-VPA.

(v) Some members of the ALBWG expressed interest in examining simpler models for the 2010 assessment, e.g., age-structured production models and/or biomass dynamics models. While the decisions, above, do not exclude such models from consideration, preliminary results from any additional modelling (using most current data) will need to be reviewed during the

October 2009 ALBWG meeting. Otherwise, it will not be practical to incorporate these models into the 2010 assessment process.

8.0 PLANNING FOR THE OCTOBER 2009 ALBWG MEETING AND REVIEW OF WORK ASSIGNMENTS

8.1 Updates needed to complete the fisheries data through 2008

- ✓ All of data such as catch, length and CPUE for input to SS3 should be submitted no later than (NLT) one month prior the first day of the October 2009 ALBWG meeting.
- ✓ The latest data year for the stock assessment will be 2008.
- ✓ The data will be created according to the fishery stratification determined in this workshop. Minor or major change of the stratification should be announced by e-mail to all of participants prior to the October meeting.
- ✓ Re-consideration of fishery definition can also be tried for the fisheries other than Japan, following the process done in Japanese fisheries in this meeting.
- ✓ Because the unit of catch data can be either in number or in weight in the current version of SS3, the unit of catch should be chosen by each fishery considering its naturally reported units.
- ✓ Historical length composition of albacore catch by Taiwanese longliners is recommended to be compared with that by Japanese longliners in the spatial resolution of 5x5 degree or appropriate spatial resolutions, if confidentiality issue is resolved.
- ✓ Catch at age for inputting ADAPT-VPA will also be prepared. Suda's growth curve will be used to estimate catch at age for longline data. No age-specific CPUE for inputting VPA is required.

8.2 Updates of NPALB vital rates

The WG discussed the need for updated information on growth, maturation, and natural rates of North Pacific albacore. The stock assessment has been conducted using growth information from Suda (1966). There is a strong need to update this information and in particular, estimates of growth curve parameters given that the potential use of stock synthesis as a length-based assessment model. The need for a maturity-at-length ogive is critical for accurately assessing the reproductive potential of the NPALB stock. Such maturity at size data could be gathered in conjunction with a growth study for efficient use of sampling resources. The need to reassess the natural mortality rate of NPALB was suggested by the difference between the current assumption of natural mortality of M=0.3 and the range of M values implied by life history theory (M=0.225-0.275) considerations (Jensen 1996) based on the Suda (1966) growth curve and the maturity ogive used in the assessment. Overall, the WG believed it was important to establish an ongoing vital rate sampling and analysis plan to improve estimates of NPALB life history parameters for stock assessment.

The ALBWG was made aware of promising research on NPALB age and growth at the National Taiwan University (NTU). It is hoped that these research results will be presented to the ALBWG in October 2009.

8.3 Updates of standardized CPUE indices

- ✓ The standardized CPUE should be updated up to 2008, as possible, for each fishery.
- ✓ Standard errors for the every estimated CPUE will also be provided as for the input to SS3.
- ✓ All fishery specific problems should be identified. For example, targeting for Taiwanese

longliners; excess zero catch and fluctuated trends of CPUE for Japanese pole and line fishery; rapid increases and decreases of CPUEs in Japanese longliners; etc.

8.4 Review of decisions regarding SS3 model structure

The ALBWG spent considerable time and effort on developing revised fishery definitions for stock assessment. This effort was considered to be successful because the revised fishery definitions appeared to improve the ability of the SS3 model to fit fishery observations. The WG also considered the issue of estimation of albacore growth parameters in SS3. Initial models runs suggested that there might be a mismatch between the Suda (1966) growth curve and the observed fishery catch-at-length data. However, after the revised fishery definitions were incorporated into the SS3 data structure, the model fits to the fishery data were improved using the Suda growth curve. Overall, the WG arrived at a preliminary SS3 base model using preliminary data that incorporated the revised fishery definitions and which was relatively robust to departures from model assumptions as evidenced by a suite of sensitivity analyses.

8.5 Software for stock projections

The WG discussed the application of stock projections to provide management advice for NPALB. The WG consensus was that the SS3 projection options would not be adequate for stock projections for NPALB because of the inability to analyze the probability of achieving NPALB biological reference points in a stochastic simulation approach. The WG group concluded that there were three viable options for conducting stochastic stock projections; an R-based method used for Pacific bluefin tuna, an age-structured projection module from the NOAA Fisheries Assessment Toolbox, and an existing method used for albacore in the most recent stock assessment. The WG noted that all three methods needed some form of revision to be acceptable methods for the NPALB assessment.

8.6 Software for biological reference point estimation

The WG noted that the SS3 model was not configured to calculate biological reference points for North Pacific albacore. As a result, the WG concluded that it would be important to develop some software to estimate the biological reference points adopted by the Northern Committee. It was also noted that algorithms to conduct for such analyses had already been developed to a large extent in the most recent stock assessment.

8.7 Data submission deadline

The ALBWG agreed to submit all data no later than one month prior to the start of the 6-14 October 2009 ALBWG meeting, i.e., by **6 September 2009**. Should it be necessary to modify dates for the October meeting, the data submission deadline will be adjusted so as to retain the one month buffer.
All SS3 input data (quarterly catch and size data by fishery; annual CPUE indices and their standard errors) should be emailed to Hui-Hua Lee prior to the deadline. She will prepare an SS3 data file and distribute to all ALBWG members for verification. Once finalized, this data file will then serve a common baseline for the SS3 runs that will be made prior to the October meeting.
Similarly, all ADAPT-VPA input data (annual catch-at-age by fishery; annual CPUE indices and their standard errors) should be emailed to Koji Uosaki prior to the deadline. He will prepare an ADAPT-VPA data file and distribute to all ALBWG members for verification. Once finalized, this data file will then serve a common baseline for the ADAPT-VPA runs that will be made prior to the October meeting.

In most cases, the data needed for alternative modelling (Section 6) will be contained in the SS3 data file and NPALB Landings Table. The latter will be developed at the July ALBWG meeting. Should any

additional data be necessary, it should be identified in July and should be submitted by the data deadline, given above.

9.0 UPDATE MINIMUM SSB REFERENCE POINTS BASED ON NC DECISIONS

At the Northern Committee (NC) meeting (September 2008), the NC agreed an interim management measure for NPALB, namely to maintain the spawning stock biomass above the average of the ten historically low years (ATHL) during the assessment period (with probability greater than 50%). The associated F-based reference point ($F_{SSB\text{-}ATHL}$) was not estimated in the last (2006) stock assessment. This estimate needs to be provided to the ISC Plenary in July 2009. In this section, the minimum SSB work was discussed by the ALBWG and the $F_{SSB\text{-}ATHL}$ estimates were agreed.

R. Conser reviewed the conceptual work on minimum SSB reference points (SSB_{min}) that the ALBWG has carried out over the past several years (**ISC/09/ALBWG/INFO-3**). Much of this work was motivated by fishery managers' requests for NPALB limit reference points that would ensure with reasonable probability that SSB would not decline below the historically observed levels. Following the same algorithm used in conjunction with the 2006 stock assessment, the NC agreed reference point estimate was $F_{SSB\text{-}ATHL} = 0.72\ yr^{-1}$.

Koji Uosaki presented **ISC/09/ALBWG/07**. The Northern Committee Fourth Regular Session in 2008 adopted an interim management objective for the North Pacific albacore, specifically, to maintain the spawning stock biomass above the average level of its 10 historically lowest points. F-based reference points, i.e. Fs that maintain SSB above the threshold level were calculated in response to the new interim management objective. This work is based on the SSB estimates and future projection of SSB obtained from the result of the 2006 stock assessment for the North Pacific albacore. As the result, the reference points at probability level of 50% for the projection period 2006-2010 (5 years) was 1.13 and was 0.74 for the projection period 2006-2030 (25 years).

Discussion

The small difference in $F_{SSB\text{-}ATHL}$ estimates (for the 25-year projection period) from the two presentations (0.72 vs 0.74) are due to (i) slightly different algorithms and (ii) different computer codes used to implement the **ISC/09-1/ALBWG/INFO-3** algorithm.

The shorter term projections provided in **ISC/09-1/ALBWG/07** provide additional information to managers regarding the transient effects of recent year-classes on SSB. For the 2010 stock assessment, both short-term and long-term projection period should be provided.

10.0 UPDATE ON BIOLOGICAL RESEARCH NEEDS

At its July 2008 meeting, the ALBWG developed a proposal for the biological research needed to update and improve the assessment (Appendix 4 of the Report of ALBWG Workshop, July 2008, Takamatsu). An ISC follow-up meeting on biological research needs – chaired by Chang and Holmes –will be held 28-30 May 2009 in Pusan, Korea. At this meeting, the ALBWG discussed updates or modifications to its July 2008 proposal.

The objectives of ISC Biological Research Working Group (BRWG) meeting in May 2009 are (1) to coordinate the inputs from WGs to produce a multispecies sampling scheme, which identifies temporal/spatial/fleet proxies for sampling all species and plans for obtaining samples from areas not

currently covered by existing programs, and (2) to identify, approximately, the additional costs to obtain the required data over and above the costs of existing sampling programs.

The ALBWG's proposal for the biological research takes into account the characteristics of highly migrated species, namely, that samples should be collected from the multi nation fisheries with broad timing (seasonality) and spatially distribution. The proposed budget for the sampling included transferring fish from field to the laboratory, slide preparation at laboratory, and other additional costs.

After additional discussion of the proposal, participants felt that it is not necessary to modify the body of the ALBWG proposal. However, the proposed costs do require updating based on new information that better estimates the cost of laboratory processing of specimens, e.g., the unit cost for slide preparation for both otoliths and gonads.

A task group of ALBWG members was established to modify the cost estimates and to prepare national fisheries for the ISC BRWG meeting in May 2009. Further, a few members of this task group will participate in the BRWG meeting.
Japan – K. Uosaki (Lead);
USA – J. Childers;
Chinese-Taipei – C. Y. Chen; E. Chang
Canada – J. Holmes

11.0 COLLABORATION WITH WCPFC-SC ON NPALB AND SPALB ASSESSMENTS

The WCPFC SC4 Report recommended collaborative work on NPALB and SPALB stock assessment. The wording is somewhat unclear but the collaboration could potentially range from the ALBWG participating in SPALB assessments (and vice versa); to carrying out joint pan-Pacific albacore assessments. In this section the ALBWG discussed the potential costs and benefits of such collaboration.

While it appears premature to engage in modelling efforts that would encompass both NPALB and SPALB in a single stock assessment effort, the ALBWG is encouraged by the WCPFC-SC statement regarding the benefits of sharing assessment experience on these two stocks. For more than a decade, the ALBWG has encouraged SC/SPC scientists to participate in the ISC ALBWG meetings – a transparent process in which the stock assessments are carried out. If travel funding is available, some members of the ISC ALBWG would be willing to participate in a similar assessment process for SPALB.

12.0 ISC POLICY ON DISTRIBUTING WORKING GROUP DOCUMENTS

The independent review of WCPFC science (by MRAG) recommended that the ISC WG working papers be made publicly available via the ISC website. Implementing this recommendation would require a change in current ISC policy. The issue will be taken up by the ISC Plenary in July 2009. The ALBWG discussed the issue at this meeting.

Y. Takeuchi, chair of ISC PBFWG, summarized the discussion made during December 2008 PBFWG meeting. The PBFWG concluded the current presumption not to make working papers publicly available should be reversed. That is the current ISC policy on distributing WG documents, which does not allow access to WG documents without authors permission, should be altered to a policy which allows access unless the author states otherwise. Since the ISC does not have an administrative Secretariat, there may be some difficulties in tracking access to individual working papers (i.e., whether authors have negated the default permission).

The ALBWG discussed several alternatives from endorsing the PBFWG recommendations to intermediate policies such as placing document lists on the ISC web site with each author's contact information (each author would then decide availability). The ALBWG also discussed when WG documents should be made available, e.g., immediately following each WG meeting; after the annual ISC Plenary meeting; or other timing. ISC Chair stressed the importance of transparency in the ISC process.

The ALBWG suggests that in order to foster transparency, the ISC policy regarding public availability of its WG documents should be revised to include the following features;

(i) Working papers that are critical to the conclusions and/or consensus reached during a WG meeting should be made available. Public availability of other working papers could be left to the discretion of the lead author.

(ii) The WG Chair should decide which papers were critical. A list of these papers should appear in each WG report.

(iii) Authors of critical working papers should have two options for making their papers available:
   a. the full paper could appear on the ISC website for downloading; or
   b. only the title and author's contact information would appear on the ISC website. In this case, the author would be obligated to send the paper in a timely manner to all requestors.

13.0 FUTURE MEETING SCHEDULE OF THE ALBWG

a) ISC Biological Research WG (Pusan, Korea / 28-30 May 2009). Several members of the ALBWG participated
b) Two-day ALBWG meeting in conjunction with ISC Plenary (8-9 July 2009)
c) Full ALBWG meeting (6-14 October 2009); venue TBD
d) ALBWG stock assessment meeting (16-23 March 2010) venue TBD (possibly Japan). A small modelling subgroup may meet 9-15 March 2010 at the same location. Some flexibility (a bit earlier in March) may be possible depending on the availability of ALBWG members and requests from RMFOs.

14.0 SELECTION OF NEW CHAIR OF THE ALBWG

The current ALBWG Chair will step down immediately following this meeting. The ALBWG discussed two options for selecting a new chair.

(i) For continuity, it may be desirable to elect a new chairman at this ALBWG meeting. The new chair could then engage immediately in planning for the July ALBWG meeting as well as the ISC Biological Research WG meeting in May.

(ii) Alternatively, the election could be held during the upcoming ALBWG meeting in July 2009. More ALBWG members are likely to attend the July meeting – providing a broader opportunity for input on the next chair. Further, the time prior to the July meeting could be used to better vet potential candidates.

After discussing the options, the ALBWG decided to postpone the election of a new chair until the July 2009 ALBWG meeting.

15.0 OTHER MATTERS

G. Ishimura informally briefed the ALBWG regarding ongoing economic studies on NPALB and other tunas. The ALBWG recognizes that fishing activities (including the characteristics of fishing effort) are often driven by economic considerations and the incentives to fish. Economic data collection and analyses of NPALB fisheries could contribute greatly to effective NPALB assessment and management. It may be desirable to initiate data collection for NPALB vessel operations and for market analyses.

16.0 ADOPTION OF REPORT AND CLOSURE

16.1 Procedure for clearing the report

A draft of the entire report was reviewed by the ALBWG prior to adjournment of the WG meeting. After the WG meeting, the Chair distributed a second draft of the report via email for review, comment, and approval by the participants. Subsequently, the Chair evaluated suggested revisions, made final decisions on content and style, and provided the report for ISC9 Plenary review.

16.2 Acknowledgments

ALBWG participants collectively thanked the hosts (National Research Institute of Far Seas Fisheries and staff) for their hospitality and overall meeting arrangements, which served as the foundation for meaningful scientific discussion and a successful meeting.

16.3 Adjournment

The ALBWG meeting was adjourned at 17:00 on 21 April 2009.. The chairperson (Ray Conser) thanked all of the participants for their attendance and contributions and finally, stressed to National Coordinators the need to maintain ongoing communication concerning scientific data exchange and research results

17.0 REFERENCES

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Appendix 1

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Appendix 2

AGENDA

ALBACORE WORKING GROUP WORKSHOP

International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

14-21 April 2009
Shimizu, Japan

1. Opening of the meeting
2. Overview and meeting objectives
3. Recent developments in national fisheries
4. Data and structural issues revealed by preliminary modelling work
5. Progress on length-based SS3 modelling using data from the 2006 stock assessment
6. Alternative modelling approaches
7. Decisions regarding modelling for the 2010 stock assessment
8. Planning for the October 2009 ALBWG meeting and review of work assignments
   a) Updates needed to complete the fisheries data through 2008
   b) Updates (if any) of NPALB vital rates
   c) Updates of standardized CPUE indices
   d) Review of decisions regarding SS3 model structure
   e) Software for stock projections
   f) Software for biological reference point estimation
9. Update minimum SSB reference points based on NC decisions
10. Update on NPALB biological research needs
11. Collaboration with WCPFC-SC-SPC on NPALB and SPALB assessments
12. ISC policy on distributing working group documents
13. Future meeting schedule of the ALBWG
    a) ISC Biological Research WG (28-30 May 2009)
    b) ALBWG meeting in conjunction with ISC Plenary (8-9 July 2009)
    c) Time and place of next full ALBWG meeting (*6-14 October 2009*)
    d) Time and place of ALBWG assessment meeting (*16-23 March 2010*)
14. Selection of new chair of the ISC ALBWG
15. Other matters
16. Adoption of report and closure

Appendix 3

List of Documents

ISC/09/ALBWG/01:	Mexican Progress Report on the Albacore Tuna Fishery. L. A. Fleischer and M. Dreyfus.
ISC/09/ALBWG/02:	Rearrangement of Japanese fisheries for applying length-based SS-3 to the stock of North Pacific albacore I: offshore longline. M. Ichinokawa.
ISC/09/ALBWG/03:	Rearrangement of Japanese fisheries for applying length-based SS-3 to the stock of North Pacific albacore II: coastal longline.
ISC/09/ALBWG/04:	Rearrangement of Japanese fisheries for applying length-based SS-3 to the stock of North Pacific albacore III: pole and line fishery. M. Ichinokawa and K. Uosaki.
ISC/09/ALBWG/05:	Preliminary Population Analysis of North Pacific Albaore Based on the stock Assessment Program Stock Synthesis 3. H.-H. Lee. and R. J. Conser.
ISC/09/ALBWG/06:	Preliminary results of stock assessment of North Pacific Albacore using SS with area aggregated data of Japanese main fisheries. M. Kai.
ISC/09/ALBWG/07:	Minimum SSB reference points in response to new management objective for the North Pacific albacore. K. Uosaki and H. Kiyofuji.
ISC/09/ALBWG/08:	The Canadian North Pacific Albacore Troll Fishery. J. H. Holmes and Z. Zhang.
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