Annex 4

REPORT OF THE ALBACORE WORKING GROUP WORKSHOP

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

5-12 November 2013
Shimizu, Shizuoka, Japan

1.0 OPENING OF THE WORKSHOP

An intersessional workshop of the Albacore Working Group (ALBWG or WG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) was convened at the National Research Institute of Far Seas Fisheries (NRIFSF), Shimizu, Japan, 5-12 November 2013. The objectives of this workshop are to: (1) define fisheries and review input data series for consistency with these definitions and conflicts in primary data sources; (2) assess CPUE indices for inclusion in the model using criteria adopted by the WG at the Shanghai workshop in March 2013; (3) develop data weighting procedures and review model parameterization, assumptions, and diagnostic tools for the base-case model and future projections; and (4) develop a project charter that describes the expectations for the base case and projections for stock assessment meeting in April 2014.

Dr. Hitoshi Honda, Director of Project Management at NRIFSF, welcomed 13 participants (Attachment 1) from Canada, Chinese Taipei, Japan, the United States of America (USA), and the Inter-American Tropical Tuna Commission and wished participants a productive meeting. John Holmes, Chair of the ALBWG, noted that scientists from Mexico, Korea, and the Secretariat of the Pacific Community (SPC) were unable to attend the workshop.

2.0 MEETING LOGISTICS

2.1 Meeting Protocol

The ALBWG Chair noted that the efforts of the WG at this meeting would be collegial and follow the scientific method with an emphasis placed on empirical testing, open debate, documentation and reproducibility, reporting uncertainty, peer review and constructive feedback to authors and presenters. He recalled the reviews of the 2011 assessment and the WG responses to some of the points raised by the reviewers (see ALBWG 2012) and observed that the WG needed to show progress in addressing high priority issues for the 2014 assessment.

2.2 Review and Adoption of Agenda

A draft agenda was circulated prior to the meeting and an addition to the agenda was suggested at the meeting. This addition is denoted as 15bis in the revised agenda (Attachment 2). The revised agenda was adopted at the meeting.

2.3 Assignment of Rapporteurs

Rapporteuring duties were assigned to Chiee-Young Chen, John Holmes, Hidetada Kiyofuji, Hirotaka Ijima, Takayuki Matsumoto, Carolina Minte-Vera, Kevin Piner, Steven Teo, and Vidar Wespestad. John Holmes had the overall responsibility for assembling the report.

3.0 DISTRIBUTION OF DOCUMENTS AND WORKING PAPER AVAILABILITY

Six working papers and one information paper from Korea were submitted and assigned numbers for the workshop (Attachment 3). Steve Teo made a presentation on the USA longline fishery and CPUE index and noted that he would prepare a working paper supporting this index for the stock assessment workshop in April 2014. Hidetada Kiyofuji contributed a presentation on the stock-recruitment-environmental relationship in albacore. The policy of the ISC is to make working papers presented at WG workshops publicly available through the ISC website (http://isc.ac.affrc.go.jp/). Working paper authors were asked by the WG Chair if they wished to make their paper publicly available through the ISC website. Working paper titles, author names, and contact details will be provided for those papers that are not publicly available on the ISC website.

4.0 REVIEW OF INFORMATION NEEDS SUPPORTING FISHERY DEFINITIONS AND CPUE INDICES

4.1 Information Needs

Reviews of the 2011 stock assessment noted that the documentation supporting fishery definitions and describing the CPUE standardization process was inadequate. The WG developed information guidelines for working papers describing fisheries and CPUE development at the March 2013 workshop (ALBWG 2013) and briefly reviewed those guidelines (Table 1), noting that they were designed to ensure that the WG could evaluate the data and justification for decisions at this workshop.

4.2 Criteria used to assess strength/weaknesses of indices

The WG also reviewed a list of criteria developed at the March 2013 workshop that it will use to judge the strengths and weaknesses of potential CPUE indices at the data preparation workshop (Table 2). The goal is to provide more transparency in assessing CPUEs and assist the WG in providing information supporting decisions to include or exclude indices in the 2014 stock assessment model.

5.0 FISHERY DEFINITIONS AND CPUE INDEX ASSIGNMENTS

Four working papers were reviewed and discussed by the WG and feedback was provided to the authors. Fishery definitions in the 2011 stock assessment were based on a target fish size criterion and may have resulted in overlap among fisheries that led to mis-fitting in the model. The WG concluded during the March 2013 workshop (ALBWG 2013) that using operational characteristics rather than target fish size could result in more appropriate fishery definitions. The goal of this re-examination of the principal fisheries is to ensure that the most consistent and robust data are utilized in the model. Preliminary fishery definitions for the 2014 assessment model are summarized in Table 3.

5.1 Japan Longline Fisheries

Three working papers describing the distribution of albacore catch and effort in the Japanese long line and pole-and-line fisheries along with size composition sampling of this catch were presented and reviewed by the WG.

5.1.1. Proposed Japanese fishery definition for albacore stock assessment in the North Pacific Ocean. Presented by Keisuke Satoh (ISC/13/ALBWG-03/05)

Summary – This document proposes definitions for Japanese fisheries, including pole-and-line, longline, gillnet, and other fisheries, for the north Pacific albacore stock assessment in 2014. Size composition, historical catch records, fishing ground distribution, standardized CPUEs, and target species were investigated in support of the proposed fishery definitions and to provide descriptive details. Based on this information, we conclude that the fishery definition for long line should be separated using area and time criteria in the western side of the North Pacific Ocean.

***Discussion*:** The WG noted that Japan proposed three long line fisheries and one pole-and-line fishery plus four CPUE indices for the 2014 model based on operational and time criteria (see Table 3). The three long line fisheries consist of the Japan long line – small (JPN LL-S), which captures fish around 70-80 cm in size and is restricted to a 10° x 10° area off the southeast coast of Japan, the Japan long line – large (JPN LL-L), which captures fish around 100 cm and fishes offshore to 180°, and the Japan long line-EPO (JPN LL-EPO), which operates east of 180° and also captures fish about 100 cm in size, but moved from the EPO after 2000. The pole-and-line fishery (JPN PL) includes catch from coastal, offshore and distant water vessels combined.

CPUE indices were developed for the JPN LL-S, JPN LL-L, JPN LL-EPO, and JPN PL fisheries. The JPN LL-L was divided into two time periods (1975-1992 and 1993-2012) and standardized separately in order to address a large increase in nominal CPUE in the early 1990s that may be related to changes in catchability. The JPN LL-EPO index was based on an area north of 25°N and east of the date line, rather than the whole fishery area. The JPN PL CPUE index is based on distant water vessel data in an attempt to remove the potential effect of target switching between albacore and skipjack that occurs in some offshore vessels. After reviewing the data, the WG tentatively decided that the Japan LL-L index and the distant water JPN PL index would be the primary indices for the base case model.

A concern was raised about the JPN LL-S CPUE index because it is based on a small spatial area and may not be representative of the population as a whole. Since the model will not be spatially-explicit, it was suggested that it would be better to exclude this index from the base-case model and use it as a sensitivity run only. It was noted that this fishery captures fish that are 4-6 years old and that when this index is lagged 3 years relative to the Japan LL-L indices, there is coherence in trends and year-to-year variability. The WG's initial decision is to use the JPN LL-S index in a sensitivity run.

5.1.2. Abundance indices of albacore tuna by Japanese longline fishery in the north Pacific Ocean. Presented by Hirotaka Ijima. (ISC/13/ALBWG-03/02)

Summary - Abundance indices based on redefined Japanese albacore longline fisheries were estimated. The redefined fisheries are based on new analysis of catch at length and changes in the main fishing grounds by year. Standardized CPUE indices were developed with Generalized linear models and resulted in improved estimates of Japanese longline CPUE in the North West Pacific and it was noted that: (1) there is time lag between JPN LL-S CPUE and CPUE of the

JPN LL-L fisheries, which seems consistent with the current understanding of growth in albacore, (2) the magnitude of increase in the JPN LL-L index in the 1990s is reduced relative to the increase observed in the previous version of this index used in 2011, which was considered unrealistic, and (3) a decreasing trend in the JPN LL-S index is observed in the 1970s.

Discussion: It was pointed out that there is a large drop in the JPN LL-S index at the beginning of the time series, which started in 1966 for this working paper. It is not clear whether this drop is real or related to some other phenomenon. The WG requested that the authors follow-up in an attempt to determine the cause of the drop at the beginning of the time series.

5.2 Japan Pole and Line Fisheries

5.2.1 Standardized CPUE for albacore caught by the Japanese pole and line fishery in the northwestern North Pacific Ocean. Presented by Hidetada Kiyofuji. ISC/13/ALBWG-03/03)

Summary - Standardized catch-per-unit-effort (CPUE) for North Pacific albacore (NPALB) caught by the Japanese distant-water pole and line fleet (JPN PLDW) from 1972 to 2012 was estimated with a delta lognormal model. There are two steps to fitting this model: first, non-zero catch rates are estimated, and second, positive catches rates are estimated. Year, quarter, latitude and longitude by 5° x 5° squares (area) and vessel ID were used as main effects in the model. Vessel ID was included in the model to evaluate the effect of fishing strategy or skippers fishing experience on CPUE. A vessel effect would reflect both an increase in fishing experience within the fleet and increased targeting of albacore. Estimated CPUE decreased from 1972 to 1987, increased from 1988 to 1995, remained at the high level until 2000 and then has been increasing since 2005.

Discussion: The WG requested that the authors include information on the proportion of data used/excluded in the analysis, based on the data selection criteria used in the working paper. It was noted that the proportion of non-zero catch was near an all time low in the late 1980s-early 1990s, but positive catches were the highest on record, which is not consistent with expectations. The authors suggested that pricing may have been a factor, but indicated that more investigation is needed.

The WG noted that a primary concern with the JPN PL CPUE index is the effect of target switching between skipjack and albacore as well as the assumption of constant catchability. It was pointed out that this index is based on the distant water pole-and-line vessels and that these vessels prefer and target albacore, so target switching should not confound this index.

It was noted that there is a large increase in the JPN PL CPUE index in the early 1990s. Most of the Japanese CPUE indices exhibit this increase. It was suggested that this increase could be related to the implementation of the ban on high seas gillnets. It was also suggested that this increase could be related to a catchability change. One way to check the catchability change hypothesis is take a few of the long-term vessels shown in the time distribution plots in the working paper and plot annual CPUE. Observations should be above average post 1992-93. There was no consensus on whether this analysis should be completed in a revised working paper.

5.3 Taiwan Longline Fishery

5.3.1. Taiwanese albacore-targeting longline fisheries in the North Pacific Ocean, 1995-2011. Presented by Chiee-Young Chen (ISC/13/ALBWG-03/01)

Summary - This working paper describes the features of Taiwan albacore-targeting longline fishery operating in the North Pacific Ocean from 1995 to 2011. The Albacore-targeting fishery (Group 1) and the non-albacore-targeting fishery (Group 2) are defined based on the results of clustering and discriminant analyses. The fishery was spatially sub-divided into three sub-areas based on the similarity of catch compositions in each 5° x 5° block to conduct CPUE standardization using a General Linear Models. The albacore-targeting fishery mainly operated in the waters north of 25°N and applied less than 13 hooks per basket in their operations. The majority (98%) of Taiwanese albacore catch was contributed by the albacore-targeting fishery. Several trials of area segregation were adopted in the GLM model, and based on model fit criteria, the model with 2 sub-areas divided at latitude of 25°N explains the highest amount of variance in the data. The standardized CPUE shows an increase followed by a sharp decline in the late 1990s and then stable trend after 2000 and is believed to be more informative to the stock status of North Pacific albacore exploited by Taiwanese longline fisheries.

Discussion: It was clarified that Group 1 (albacore-targeting) catches were characterized by <13 hooks per basket (HPB) and that Group 2 (non-albacore targeting) catches were characterized by >14 HPB. Based on extended discussion during data preparation for the 2011 stock assessment and the size composition data presented in this paper, the WG recommends using the size composition data from 2003 to the present for estimating selectivity in this fishery. Size composition data collection prior to 2003 are biased and these data are not considered representative of size composition in the overall catch. The WG noted that catches in Areas B and C (Group 2 – non-targeting sets) are small and coincide roughly with the area in which the US shallow set longline fishery operates. The WG agreed that Group 1 fishery (mostly in Area A north of 25°N) should be used for the standardized CPUE index for the TWN LL fleet and recommended that for selectivity purposes Area A size composition data be used to estimate selectivity. Catches in Areas B and C (south of 25°N) can be mirrored to the USA LL for selectivity purposes.

5.4 Eastern Pacific Ocean (EPO) Troll Fishery

5.4.1 An update of the standardized abundance index of US and Canada albacore troll fisheries in the North Pacific (1966-2012) presented by Steve Teo. (ISC/13/ALBWG-03/06)

Summary - US-Canada albacore troll/pole-and-line (surface) fisheries data were merged and used to develop a standardized abundance index from 1966 to 2012. Catch and effort data were aggregated into 1° x 1° spatial blocks on a monthly basis from logbooks, and a generalized linear model was used to standardize the catch-per-unit-effort (CPUE) followed by bootstrapping to determine the confidence intervals. Based on previous studies on the effects of temperature gradients on albacore CPUE, the data were further split into different areas (eight) and periods to examine the catchability changes over time and space. An abundance index based on open ocean data (west of 140°W) had a different trend than an index based on coastal data (east of 140°W). The index based on the entire dataset is highly determined by the coastal time series because most of the effort occurs in coastal areas and there is insufficient effort in the open ocean to provide a representative index. In addition, there was a substantial change in fishery operations in 2012 that might have influenced the abundance index. Canadian vessels were not allowed in US waters to fish for albacore tuna due to a lack of a fishing regime pursuant to the US-Canada albacore treaty, and appeared to have experienced lower CPUE as a result. Based on the results of this study, we recommend that the US-Canada surface fisheries abundance index (EPO TR) be used in the sensitivity runs of the stock assessment because the local abundance of albacore in the coastal area not only depends upon population changes but also on migration rates to the coastal areas, which are likely variable and may not be accounted for in the standardization. In addition, we recommend that either the 2012 data point be dropped for this assessment or that only the US data be used for the index to account for the large change in fishery operations for these fisheries.

Discussion: It was noted that the three time periods used in the standardization correspond to different operational phases of the EPO TR fishery: an early discovery phase in coastal areas, an expansion phase when vessels moved offshore into the open ocean, and a second coastal phase when vessels consolidated their operations in coastal waters. The abundance indices show high variability, which may be related to an inability to remove the influence of the salmon fishery during standardization. Many of the vessels in this fishery are salmon troll vessels so conditions in salmon fisheries will affect participation in the albacore fishery. The coastal abundance index appears to have lower noise than the full index or the open ocean index. The WG agreed with the recommendation that open ocean index is largely noise and should be excluded during the standardization process. The WG recommends using the coastal index as a sensitivity run rather than in the base-case model because this index may not be representative of the population as whole in the eastern Pacific Ocean owing to the small area (30-50°N, coast to 130°W) and the fact that migration into coastal waters is an important process exhibiting interannual variability. The WG discussed the 2012 data point and agreed to drop it from the standardization process since the treaty-related change likely influenced both Canadian and US vessels. The WG noted that the working paper was missing some key information items (e.g., diagnostic plots of the standardized index) and requested that Canadian and US scientists revise the working paper to include these items for the stock assessment workshop in April 2014.

5.5 USA Longline Fishery Description and Data to be used in the 2014 stock assessment. Presentation by Steven Teo.

Presentation Summary: The US longline fishery (USA LL) is primarily based in Hawaii, with one vessel still operating out of California, and the data used for the assessment will be based on the Hawaii fleet. Albacore catches from the California longline vessel are included in the catch data for this fishery. The USA LL fishery is composed of a deep-set (DS) component targeting bigeye tuna and a shallow-set (SS) component targeting swordfish. The size of albacore caught by these components differs, with the deep-set fishery catching substantially larger fish (90-120 cm) than the shallow-set fishery. The deep-set fishery operates mostly south of 30°N and around the Hawaiian Islands. The proportion of shallow-set effort in relation to the deep-set fishery has changed substantially due to regulatory changes. Besides size composition data, a standardized abundance index of the US deep-set longline fishery (USA LL) was also developed using a delta-lognormal model with year, area, and season as explanatory factors. Residual patterns were observed in the lognormal part of the model. The authors recommended that the US deep-set longline index be used in a sensitivity run rather than the base case run because the fishery operates in a relatively limited area around the Hawaiian Islands as compared to the Japanese longline fishery and regulatory changes in the fishery, especially the shallow-set component of the fishery, likely affected the operations and catchability of the fishery.

Discussion: A preliminary CPUE index based on USA DS LL data was prepared and it was noted that this index mitigated the influence of regulatory effects that altered the shallow-set fishery. The WG agreed with the recommendation that the USA deep set longline index be used as a sensitivity run rather than in the base case model because it provides alternate trends in 2000s relative to the JPN LL-L index. The WG also recommended mirroring the TWN Areas B+C fishery to the USA DS LL and the USA SS LL fishery to the TWN Area A fishery for selectivity purposes. The WG requested that US scientists prepare a working paper on the USA LL fishery for review at the stock assessment workshop in April 2014.

5.4 Chinese Longline Fishery

The WG Chair received 2012 north Pacific albacore catch estimates for China and non-ISC countries from the SPC about a week prior to the workshop. The Chinese longline fishery is growing but there are few data available from this fishery. The 2012 catch estimate for China is 6,092 t, which is a substantial increase relative to 2011 (see Chen et al. 2013: ISC/13/ALBWG-01/02). The WG recommended creating a fishery for China longline data (CHN LL) in the 2014 stock assessment and tasked the WG Chair with requesting quarterly catch data from China.

5.5 Albacore Behaviour

5.5.1 Vertical and horizontal changes of North Pacific albacore derived from archival tag data. Presented by Hidetada Kiyofuji (ISC/13/ALBWG-03/04)

Summary - Horizontal and vertical movements of north Pacific albacore are described based on archival tag data and inferences concerning fishery interactions are discussed in this document. One tag was recaptured after a long release period from April 18, 2002 to February 25, 2003 (313 days). This albacore moved from warmer waters in the south of Japan during winter to colder waters in the north, which are characterized as a higher productivity area. Significant vertical depth changes were identified when this fish moved northward with a shallowing of depth coincident with its northward movement. It was also noted that this fish remained near the Emperor sea mount chain for approximately one month (September). Vertical habitat is characterized by deeper depths (500m) in south of Japan where temperatures are warmer and shallower depths (>100m) in the Kuroshio Extension area where temperatures are cooler. Albacore could be targeted by both longline and pole-and-line fisheries in winter and early spring in the southern Japanese waters, but only pole-and-line can target in northern area due to their shallower swimming depth in the Kuroshio Extension area.

Discussion: This paper provides data on the movements of albacore near Japan in both the Japan LL-S and Japan PL fishery areas that is consistent with the idea that the same fish are accessible to both fisheries. The WG was pleased to see this work and looks forward to further results.

5.5.2 Stock-recruitment-environmental relationship for North Pacific albacore (Thunnus alalunga) presentation by Hidetada Kiyofuji.

Summary - Recent studies on climate, physical, biological and ecosystem dynamics in the North Pacific Ocean support the concept of decadal environmental variability (regime shift). Recruitment is an important process that drives population dynamics of tunas and this complex process may be influenced by climatic and environmental forcing. The stock-recruitment-environmental relationship was examined for North Pacific albacore (*Thuunus alalunga*) based on spawning biomass and recruitment estimated in the 2011 stock assessment and several possible climatic indices such as the Pacific Decadal Oscillation index (PDO). In this study, we analyze the effect of environmental variability on the recruitment of North Pacific albacore. If the effect of environmental variability on recruitment can be explained in stock assessment, it could improve our understanding of stock-recruitment-environmental relationships and also the implementation of harvest control rules.

Discussion: This presentation is an update of work originally presented at the March 2013 workshop in Shanghai. The WG was encouraged to see that this work is continuing and that it is starting to produce some interesting results that may be useful for future stock assessments.

6.0 INPUT DATA REVIEW FOR CONFLICTS

The WG recognized the necessity of understanding the representativeness of each CPUE index for prioritizing in the model. Several indices for both juvenile and adult fish have been proposed for the 2014 stock assessment model. Reviews of the 2011 stock assessment noted that all indices (N = 8) were used, despite a lack of coherence in trends and discrepancies in some trends. The WG reviewed CPUE trends for commonalities and differences and size composition data from the different fisheries for quarterly and seasonal trends to ensure that the most robust, high quality data are used to inform the 2014 assessment model. The results of these comparisons are recorded below.

6.1 CPUE

The WG reviewed several plots of juvenile (Figure 1) and adult (Figures 2 and 3) abundance indices and made the following observations. The juvenile indices, JPN PL, JPN LL-S, and EPO TR show similar trends and appear to be in phase through the 2000s, but they exhibit different magnitudes of variability. The juvenile indices all seem to show increases in the early 1990s. The EPO TR index lacks contrast early in the time series relative to the JPN PL index. The WG agreed to use the JPN PL index as the main juvenile index in the base case model since it's based on a larger spatial area than either the EPO TR or the JPN LL-S indices. Furthermore, there were historical spatial changes in the location of the EPO TR fishery and as a result it may not be representative of entire stock. It was noted that juvenile movement patterns are complex and that using one index that was based on a large spatial area and long temporal history was probably a better way to capture these dynamics than using multiple indices since a spatially explicit model was not contemplated for the 2014 assessment.

A plot was prepared of the JPN LL-L CPUE for 1975-1992 estimated with data from 20 to 35°N and with data from 25 to 35°N (Figure 2), to check how the index is affected by the data used in standardization. Since the two indices are nearly identical, the WG agreed to use the data the larger area (20-35°N) for index standardization.

A plot of the main juvenile (JPN PL, EPO TR, JPN LL-S) and adult (JPN LL-L) indices with the juvenile indices lagged relative to the adult index (Figure 3) shows that most of these indices increased concurrently in the 1990s. However, prior to the 1990s the JPN LL-L and JPN PL indices exhibit declining trends whereas the JPN LL-S exhibits an increasing trend. The WG was concerned that the JPN LL-S index was affected by a change in catchability in the 1980s . The WG agreed to use the JPN LL-S index as a sensitivity run in the stock assessment rather than in the base case model. Japan is continuing to investigate whether dividing the JPN LL-S into two periods and standardizing separately will address the apparent difference in trends in the early period.

The JPN LL-EPO and JPN LL-L1 (1975-92) show similar declining trends through the 1970s and 1980s and an increase in the early 1990s, although the JPN LL-EPO index shows this increase earlier than the JPN LL-L index (Figure 4). It was hypothesized that the JPN LL-EPO index may be affected by geographic shifts in effort during this period that were not removed during the standardization process. The TWN LL exhibits a large increase and then a sharp decline through the late 1990s to mid-2000s that is inconsistent with the other indices, but trends through the 2000s are consistent with JPN LL-L2 (1993-2012) index. It was suggested that the spike in the late 1990s might be related to the concentration of effort into a small spatial area during this period. The USA LL index exhibits different trends than the JPN LL-L2 index and has issues related to regulatory changes and small spatial area that cannot be fully accounted for during standardization (Figure 5). The WG agreed to use the TWN LL and USA LL indices as sensitivity runs in the assessment since they exhibit alternative trends to the JPN LL-L2 index. It was also decided that the JPN LL-EPO index should not be used in either the base case model or a sensitivity run because the fishery changed spatially and there is no information on the size of fish that were targeted.

The WG agreed to use the JPN LL-L index (both periods) as the main adult index in the assessment model. This fishery records the highest proportion of the total north Pacific albacore catch and it occurs over a large area with consistent effort in time and space whereas the TWN LL and USA LL fisheries occur in smaller areas and over shorter time periods. This decision coupled with the decision to use the JPN PL as the primary juvenile index leads to two important assumptions: (1) juvenile movements dynamics are adequately accounted for in the JPN PL index, and (2) the majority of adult biomass occurs in the western and central Pacific Ocean. The WG notes that it’s current understanding of the migration dynamics of juveniles and adult habitat are consistent with these assumptions.

During the WG’s review of the JPN PL working paper, there was concern that the third quarter (Q3 – July-Sept) size composition data included smaller fish than observed in other seasons so the WG examined a plot of this index calculated based on Q2 (April-June) data and all seasons (Figure 6). Although a pulse of small fish is observed in Q3 and may be a recruitment event or something related to migration dynamics, the JPN PL index is driven by the Q2 fish as this is the main fishing period for this fleet. The WG tentatively agreed to keep both the Q2 and all season indices until it decides whether or not seasonal fisheries are required.

6.2 Size Composition

Size composition data from longline fisheries operating in the Pacific near Hawaii (JPN LL-EPO, TWN LL, USA LL) were examined (Figures 7 and 8) to assess the reliability of these data and determine which dataset(s) would be used to estimate selectivity. The JPN LL-EPO size composition data are relatively consistent in the northern and southern areas (25°N) and these size data will be used to ensure that catch in this fishery is removed at the right size.

Fish size in the JPN LL-L2 was larger than in the USA LL or TWN LL and fish size in the areas south of 25°N area was larger than that in areas north of 25°N. Based on these observations, the WG suggested splitting the catch and size data in the TWN LL into Group 1 (albacore targeting sets north of 25°N) and Group 2 (non-albacore targeting sets south of 25°N). The WG also recommended splitting the USA LL into shallow-set (mainly north of 30°N) and deep-set (mainly south of 30°N) components. Selectivity in the TWN LL Group 1 fishery, which accounts for 98% of the TWN LL albacore catch, will be estimated from the size composition data. Selectivity of the Group 2 fishery will be mirrored to the USA DS LL size composition data. Considering the amount of catch and size sampling, it was suggested that selectivity of the

JPN LL-EPO north of 25°N should either be estimated or mirrored by TWN or USA LL and south of 25°N, it should be mirrored to the USA DS LL fishery.

The USA SS LL size data are similar to the TWN LL Group 1 data (Figure 7) while the USA DS LL data are similar to the TWN LL Group 2 data (Figure 8) and JPN LL-EPO in the southern area. The WG decided that fishery selectivity in the USA DS LL fishery would be estimated, as these size data are considered more reliable than the USA SS LL size data. The WG has not made a decision on estimating or mirroring the selectivity of the USA SS LL fishery.

7.0 ASSESSMENT OF CPUE INDICES

The WG assess the strengths and weaknesses of all proposed abundance indices against the criteria previously discussed for this purpose (ALBWG 2012). Preliminary decisions concerning the inclusion/exclusion of specific indices, along with a rationale for the decision, are summarized in Table 4.

The base case model will use the JPN PL and JPN LL-L1 and L2 indices as the primary juvenile and adult abundance indexes. All other proposed indices will be considered for sensitivity runs, except the JPN LL-EPO index. The JPN LL-EPO index is not considered representative of abundance changes and will not be used in either the base case model or a sensitivity run.

8.0 MODEL FITTING PRINCIPLES

A discussion of the principles for fitting the model identified the following ideas:

1. The model should be fitted to CPUE and size data that are believable, but if a choice is necessary, then fit to CPUE should be emphasized;
2. Reasonable weights should be assigned to the different data types; and
3. Process in the form of time varying selectivity/catchability, etc., will be added to the model to better fit the data rather than down weighting a data type or fleet.

9.0 WEIGHTING OF INPUT DATA TYPES

The WG recommends that equal weighting be applied initially to the data and that rather than down weighting to reduce the effect of misfits to secondary data, process in the form of time varying selectivity/catchability will be added to account for the misfits.

10.0 CATCHABILITY

Catchability was not discussed as a separate item, but was included in fishery definition and CPUE discussions (see Sections 5.0-7.0).

11.0 BASE CASE SCENARIO: ASSUMPTIONS AND RATIONALE

The WG discussed structural and parameter assumptions for the 2014 and developed a provisional base case scenario parameterization during the workshop. This parameterization and the rationale behind these decisions are shown in Table 5.

12.0 OTHER MODELING SCENARIOS

There was no specific discussion of alternative modeling scenarios/assumptions as these items were discussed during the base case scenario (Section 11.0), sensitivity analysis (Section 13.0) and projection scenario (Section 14.0) discussions.

13.0 SENSITIVITY ANALYSES

The WG discussed a suite of potential sensitivity analyses to be completed during the 2014 stock assessment. Sensitivity analyses will be used to inform the WG about: (1) effects of model changes relative to previous assessment specification, (2); model performance (effect of assumptions on results), and (3) to provide a range of plausible uncertainty. It was noted that the full range of sensitivity runs will not be determined until completion of the stock assessment, but a preliminary set of runs is given in Table 6.

14.0 PROJECTION SCENARIOS

The WG discussed several probable projection scenarios and agreed to the following:

1. Constant fishing at Fcurrent;
2. Constant fishing at $F_{2006\text{-}2008}$;
3. Constant fishing at $F_{2002\text{-}2004,}$ the reference level for the current IATTC CMM; and
4. Constant catch based on same years used to estimate Fcurrent.

It was noted that the Northern Committee may request specific scenarios and that these requests would be forwarded to the WG in December 2013. All projections will be conducted assuming low, average, and high historical recruitment for a minimum total of 3 x 4 = 12 projections.

The WG will follow the procedure used in the 2011 assessment and estimate current F as the geometric mean of three years (2009-2011) prior to the terminal year (2012) to reduce outlier effects. The relative value of F (F-multiplier) will be presented with respect to reference points for assessing stock status.

The starting point of future projections was also discussed. The projection software estimates recruitment either through resampling of historical periods or a spawner-recruit relationship. The WG noted that it will conduct projection scenarios assuming low, average, and high historical recruitment and so will start the projections in the terminal year -1.

The WG recommends using the R-code used in the 2011 albacore assessment to conduct future stochastic projections with Stock Synthesis outputs (see Ichinokawa 2011). This R-code conducts stochastic future projections with optional assumptions on future recruitment and harvesting scenarios.

15.0 ASSESSING STOCK STATUS

The quantities to be computed for assessing stock status are ratios of Fcurrent to potential fishing mortality reference points, SSB(t) corresponding to those reference points and equilibrium yield (t) corresponding to the reference point. The potential reference points to be included are those used in the 2011 stock assessment report as well as the NC9 information request ($F_{SSB\text{-}ATHL}$, F_{MAX}, $F_{0.1}$, F_{MED}, $F_{10\%}$, $F_{20\%}$, $F_{40\%}$, $F_{30\%}$, $F_{50\%}$). In addition, since a steepness parameter value of 0.9 will be used, MSY, F_{MSY} and SSB_{MSY} will be estimated. Final decisions on reference points will be taken at the stock assessment workshop in April 2014. The WG tentatively noted that $F_{SSB\text{-}ATHL}$ likely will be estimated as the average of the 10 lowest points in each bootstrap run but will revisit this decision at the assessment workshop. Other quantities may also be computed following requests by the Northern Committee that may be delivered in December 2013. Japan will estimate $F_{SSB-ATHL}$ and US scientists will estimate all other reference points.

15.0bis ALTERNATIVE MODELING APPROACHES

The WG discussed running two alternative models for comparison to the more complex approach taken in the SS3 stock assessment model. The alternative model results would be used only as diagnostic tools, particularly in addressing biomass scaling in the base case model, which was an unresolved issue in the 2011 assessment. The two alternatives that were discussed include a simple production model and a delay-difference model.

Japan committed to providing results from a production model (ASPIC) and the WG discussed and agreed to the parameterization shown in Table 7. The simple production model will be based on the JPN LL-L1 and L2 indices with the shape parameters fixed such that MSY is 20-30% of K. Discussion of a delay-difference model was tentative as it is not certain that one will be run. However, if it is run, this model will begin in 1975 and use the JPN PL index (for juveniles) and the JPN LL-L1 and L2 indices for adults as the primary biomass scalars. The model will use a steepness parameter of 0.9, and the length-weight relationship will be the same as assumed for the stock assessment model. The delay will be 3 years, which corresponds to the age difference between the targeting age of the juvenile and adult indices.

16.0 RECOMMENDATIONS

The WG provides the following recommendations for the 2014 stock assessment.

16.1 Stock Assessment

The stock assessment model will be an integrated age-structured, size-based multi-fleet model with quarterly time steps implemented in the Stock Synthesis modeling platform. The two primary biomass indices will be the JPN PL for juveniles and the JPN LL-L1 and L2 for adults.

16.2 Data format and submission deadlines

The WG recommends a data submission deadline to the WG Chair of 1 January 2014. A spreadsheet will be compiled of the submitted data and forwarded to WG members for final review by Jan 15, 2014. Data and control files for SS3 will be prepared and distributed to WG members by 1 February 2014 and the data will be frozen for analysis. Errors or corrections to these datasets will be reviewed during the stock assessment workshop. Annual catch data for years prior to 1966 and quarterly catch and size composition data for 1966 to the present should be submitted.

16.3 Diagnostic tools

The WG recommends running a surplus production model and, if possible, a delay difference model, to provide diagnostic input for the more complicated SS base case model.

16.4 SS3 Version for Stock assessment

The currently distributed version of SS3 is 3.24f. It is recommended that the most current version as of 1 January 2014 should be used for the stock assessment.

16.5 Research

The WG identified estimating natural mortality as a priority for the 2014 stock assessment and assigned the task to US scientists.

17.0 WORK PLANS AND ASSIGNMENTS FOR STOCK ASSESSMENT WORKSHOP

17.1 Work Plans

1 December 2013 – data format spreadsheet distributed to WG members
1 January 2014 – data submission deadline to WG Chair
15 January 2014 – data spreadsheet compiled and distributed to WG members
1 February 2014 – data and control files for SS3 checked and distributed to WG members
15 February 2014 – WG members determine stock assessment workshop dates via email
07 April 2014 – preliminary modeling report prepared and distributed to WG members
14-28 April 2014 – stock assessment workshop in La Jolla, CA.

17.2 Work Assignments for Stock Assessment Workshop

Revise JPN PL working paper – Japan
Revise JPN LL-small working paper - Japan
Revise EPO Troll working paper – USA and Canada
Prepare USA LL working paper – USA
Prepare working paper on alternative natural mortality estimates - USA
Obtain quarterly catch data for Chinese longline – WG Chair
Determine availability of quarterly catch data from Korea – WG Chair

18.0 OTHER MATTERS

18.1 Time and Place of Next Meeting

The next meeting will be the stock assessment workshop, sometime in the 14-28 April 2014 period, hosted by the National Marine Fisheries Service at the Southwest Fisheries Science Center in La Jolla, CA. The exact dates of the workshop will be determined in Feb 2014.

18.2 Preliminary Diagnostic Work

A preliminary SS model run was reviewed to check the data in the model and preliminary modeling decisions. No obvious data reading problems were flagged. It was noted that conditions in the early part of the modeled period differ from later part and that this difference will be challenging when fitting the model. Further investigation of JPN LL catch and effort data in the 1966-1975 period will be conducted in an attempt to resolve issues identified at this workshop for the stock assessment workshop.

19.0 CLEARING OF THE REPORT

The WG Chair prepared a draft of the report, which was reviewed by the WG prior to adjournment of the workshop. After the workshop, the WG Chair evaluated and incorporated suggested revisions, made final decisions on content and style and distributed a second draft of the report via email for approval by the WG members. Subsequently, the WG Chair provided the report to the Office of the ISC Chair for review at the ISC14 Plenary Session.

20.0 ADJOURNMENT

The ALBWG meeting was adjourned at 12:35 on 12 November 2013. The WG Chair thanked the hosts (Dr. K. Satoh, NRIFSF) for their hospitality and overall meeting arrangements, which served as the foundation for meaningful scientific discussion and a productive meeting. He also thanked all of the participants for their attendance and contributions and stressed the need to maintain ongoing communication and cooperation concerning the exchange of data and results as the WG gears up to the stock assessment workshop.

21.0 LITERATURE CITED

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Table 1. Information requirements in working papers to support the development of abundance indices. Taken from ALBWG (2013).

Fishery description	Describe fishery including catch, effort, size composition of catch, nominal CPUE by area, season, history of fishery development and changes
Analysis description	Describe data selection, CPUE standardization model, and CPUE estimates. Include any data filtering, outlier removal
Statistical Results	Provide model diagnostics and goodness-of-fit criteria relative to alternative model configurations; ANOVA tables, etc.
Nominal/Standardized	Comparison plot of nominal and standardized indices
Diagnostic plots	QQ, residuals, etc.
Point estimate & variability	Characterize uncertainty in estimates of standardized CPUE; SE or CV of standardized CPUE (generated or assumed)

Table 2. Criteria for evaluating the strengths and weaknesses of candidate abundance indices to represent relative abundance of north Pacific albacore in the 2014 stock assessment model. Taken from ALBWG (2013).

Criterion	Description
Spatial distribution	Portion of north Pacific covered by fishery; latitude and longitude
Size/age range	Distribution of size or ages in catch
Fishing ground map	Showing area of operations for each fishery by season/decade
Relative contribution	Proportion of total catch in fishery
Temporal coverage	Time period of data collection
Temporal consistency	Change in spatial location of fishing grounds over temporal period, e.g., decadal changes/seasonal changes
Temporal consistency in size composition	Decadal and seasonal changes in size of fish captured
Statistical soundness	Standardization method, diagnostic plots and CPUE variability provided
Targeting	ALB primary target, by-catch species
Catchability Changes (due to management, fishing practices, etc.)	External factors affecting catchability (e.g., management practices, fishing technology, targeting changes)
Socio-economic factors	Price, demand, technological changes (e.g., freezers), etc.

Table 3. Preliminary fishery definitions and descriptions for use in the 2014 north Pacific albacore stock assessment model.

Fishery (acronym)	**Gear**	**Spatial Location**	**Catch History**	**Catch Units**	**Size composition**	**Selectivity**	**Documentation**
JPN LL-small (JPN LL-S)	Longline	25-35°N & 130-140°E	Number 1952-2012 Weight 1966-2012 Break into 2 periods quarterly catch data	Number & weight	1967-2012	Estimated	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/05
JPN LL-large (JPN LL-L)	Long line	10-55°N & 130°E-180° (excluding JPN LS area)	Number 1952-2012 Weight 1966-2012 Break into 2 periods quarterly catch data	Number & weight	1967-2012	Estimated	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/05
JPN LL EPO (JPN LL-EPO)	Long line	10-55°N & 120°W-180°	1952-2012; Break catch into EPO-North and EPO-South quarterly catch data	Number & weight	1967-2012; Break into EPO-North and EPO-South	EPO-N: Estimate or mirror TWN LL or USA LL EPO-S: Mirror USA LL	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/05
JPN PL	Pole and line	10-55°N & 120°E-120°W	1952 -1965 annual catch data, 1966 -2012 quarterly catch data	Weight	1967-2012	Estimated	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/03
TWN LL	Long line	0-50°N & 120°E-95°W	1995-2011; Break catch into Group 1 and Group 2	Numbers	2003-2012; Break into Group 1 and 2	TWN-Group1: Estimated TWN-Group2: Mirror to USA LL	ISC/13/ALBWG-03/01
USA LL	Long line	0-40°N & 170°E-120°W	1952-2012; Break catch into shallow (north) and deep (south) set data	Weight	1994-2012; break into shallow and deep set	USA-SS: Estimate or mirror TWN LL or EPO-N USA-DS: Estimate	S. Teo presentation, working paper to be prepared for stock assessment workshop
EPO TR	USA & CAN Troll and pole-and-line	10-55°N & 160°E-120°W	1952-2012; quarterly	Weight	1966-2012	Estimate	ISC/13/ALBWG-03/06
JPN MISC	Seine, troll, setnet, other	Coastal Japan EEZ waters	1966-2012; quarterly	Weight	None	Mirror JPN PL	ALBWG 2011 (2011 stock assessment)
EPO MISC	PS, GN, Tropical troll, sport, others; MEX PS, PL	Coastal EEZ waters of USA, Canada and Mexico	1962-2012; seasonal catch based on US troll logbooks	Weight	None	Mirror EPO TR	ALBWG 2011 (2011 stock assessment)
JPN GN	Driftnet	20-55°N & 120°E-160°E	1966-2012; quarterly catch data	weight	None	Mirror JPN PL	ALBWG 2011 (2011 stock assessment)
TWN & KOREA GN (TK GN)	Gillnet	20-55°N & 120°E-180°	1980-1992; annual catch data	weight	None	Mirror JPN PL	ALBWG 2011 (2011 stock assessment)
KOREA and others LL (KO LL)	Long line – includes SP countries	10-55°N & 120°E-120°W	1973-2012; Korea annual catch data 1993-2012; annual	Weight	None	Mirror JPN LL-L	ALBWG 2011 (2011 stock assessment)

			catch non-ISC countries				
CHINA LL (CHN LL)	Long line	0-20°N, 140°E-100°W	2002-2012; annual catch data	weight	None	Mirror USA LL DS	ISC/13/ALBWSG-01/02

Table 4. Abundance (CPUE) index descriptions and preliminary decisions concerning use in 2014 stock assessment model.

Criterion	**Japan LL-small (JPN LL-S)**	**Japan LL-large75-92 (JPN LL-L1)**	**Japan LL large93-12 (JPN LL-L2)**	**Japan EPO LL (JPN LLE)**
Spatial distribution (latitude, longitude)	10° x 10°; 25-35°N, 130-140°E	20-35°N, 130°E-180° (excluding JPN LL-S area)	10-35°N, 130°E -180° excluding JPN LL-S area)	25-35°N, 140-180°W
Size/age range	Small average sized fish with 70-80 cm peak; range 56-116 cm; skewed distribution	Larger average sized fish, range 70-120 cm, peak 100 cm	Larger average sized fish, range 70-120 cm, peak 100cm	Variable size fish, 72-126 cm range, peak 108 cm, skewed to smaller sizes
Fishing ground map	Maps provided in supporting WP	Maps provided in supporting WP	Maps provided in supporting WP	Maps provided in supporting WP
Contribution to total catch	2-18%	6-22%	11-28%	>0-12% (100-6000 t)
Temporal coverage of data	1975-present	1975-1992	1993-2012	1975-2000
Temporal consistency of fishing grounds (seasonal/longer term)	Consistent – small area no seasonal or longer term changes in fishery location	Consistent – seasonal changes within fishing ground (northern area primarily with offshore vessels), but no long term change in location of fishing grounds as primarily northern area; shift of Japan EPO LL to west	Captures expansion of coastal and offshore fishery to south area and expansion west to east; captures contraction in northern area from east to west; Seasonal changes from north to south	Core area relatively constant (accounts for 70-80% of total catch in this fishery) but northern and eastern expansion/contraction along edges in 1980s and 1990s; strong contraction east to west in 2000s (standardized CPUE up to 2000 only); Q1 and Q4 primary catch periods, no seasonal change in grounds (north of 25N is prime area)
Temporal consistency in size composition	Seasonal changes in size; small in Q1/Q2, larger fish in Q3/Q4, but main catch period is Q1/Q2	Consistent size composition among seasons but in 1980s some interannual differences show up, especially in Q2	Consistent size composition among seasons after 2000 some interannual differences show up, especially in Q1 and Q2 (smaller fish than captured historically)	Plots to come of quarterly size compositions and size composition within core area
Targeting	Primary target species	Bycatch species but seasonally targeted in Q1/Q4	Bycatch species but seasonally targeted in Q1/Q4	Bycatch species

Catchability Changes	Depression in 78-79 index values may be related to catchability change; late 1980s-early 1990s increase in index may be related to catchability change not accounted for by use of HPB in standardization process.	Might change seasonally when switch to targeting ALB	Might change seasonally when switch to targeting ALB	Might be historical changes related to changes in targeting practices and gear used – bigeye and deeper gear
Socio-economic factors	Early 1990s price stable, demand increased for fresh sashimi; ban on high seas driftnets occurred end of 1992	Early 1990s price stable, demand increased for fresh sashimi; ban on high seas driftnets occurred end of 1992	Early 1990s price stable, demand increased for fresh sashimi; ban on high seas driftnets occurred end of 1992	
Supporting Working Paper	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/05	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/05	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/05	ISC/13/ALBWG-03/02 ISC/13/ALBWG-03/05
CPUE Decision – preliminary	Likely use as sensitivity run but not in base case	Main adult index in base case model	Main adult index in base case model	Not used in base case and will not be used as sensitivity run
Rationale	Based on small spatial area (10 x 10). Early period through 1980s shows declining trend, inconsistent with JPN LL-large; Decline may be related to catchability change not removed by standardization; will investigate cutting into 2 periods and standardizing separately.	Operates over large area of Pacific, long time series, consistent effort in space and time, standardization seems to have accounted for catchability changes	Operates over large area of Pacific, long time series, consistent effort in space and time, standardization seems to have accounted for catchability changes	May have been effort changes in time series that affect catchability and has not been removed by standardization. Index ends in 2000. Not considered representative owing to catchability changes and lack of knowledge concerning target size.
Best Available Science Information (BASI) Development in Working Papers				
Fishery description	Described in terms of historical catch, effort, size composition, seasonal distribution of fishing grounds, and potential target species (PTS). PTS is the species for which the expected probability of catch is high.	Described in terms of historical catch, effort, size composition, seasonal distribution of fishing grounds, and potential target species (PTS). PTS is the species for which the expected probability of catch is high.	Described in terms of historical catch, effort, size composition, seasonal distribution of fishing grounds, and potential target species (PTS). PTS is the species for which the expected probability of catch is high.	Described in terms of historical catch, effort, size composition, seasonal distribution of fishing grounds, and potential target species (PTS). PTS is the species for which the expected probability of catch is high.

Analysis	Negative binomial model used with GLM for standardization. Explanatory variables year, quarter, area (5° x 5°), hooks per basket, and an effort offset. Standardized CPUE values are estimated as least squares means in the GLM	Negative binomial model used with GLM for standardization. Explanatory variables year, quarter, area (5° x 5°), hooks per basket, and an effort offset. Standardized CPUE values are estimated as least squares means in the GLM	Negative binomial model used with GLM for standardization. Explanatory variables year, quarter, area (5° x 5°), hooks per basket, and an effort offset. Standardized CPUE values are estimated as least squares means in the GLM	Negative binomial model used with GLM for standardization. Explanatory variables year, quarter, area (5° x 5°), hooks per basket, and an effort offset. Standardized CPUE values are estimated as least squares means in the GLM
Statistical results	GLM ANOVA table and other standard statistical output not provided in working paper.	GLM ANOVA table and other standard statistical output not provided in working paper.	GLM ANOVA table and other standard statistical output not provided in working paper.	GLM ANOVA table and other standard statistical output not provided in working paper.
Nominal & Standardized Index	Compares nominal and standardized CPUE as well as CPUE used in 2011 assessment	Compares nominal and standardized CPUE as well as CPUE used in 2011 assessment	Compares nominal and standardized CPUE as well as CPUE used in 2011 assessment	Compares nominal and standardized CPUE as well as CPUE used in 2011 assessment
Diagnostic plots	Frequency distribution of catch, hooks per basket by year, residuals from standardized index	Frequency distribution of catch, hooks per basket by year, residuals from standardized index	Frequency distribution of catch, hooks per basket by year, residuals from standardized index	Frequency distribution of catch, hooks per basket by year, residuals from standardized index
Point estimate and variability in index values described	Point estimates of index in graphical format but not tabular format. Estimates of variability not provided in working paper	Point estimates of index in graphical format but not tabular format. Estimates of variability not provided in working paper	Point estimates of index in graphical format but not tabular format. Estimates of variability not provided in working paper	Point estimates of index in graphical format but not tabular format. Estimates of variability not provided in working paper
Working Paper Revisions	Split into 2 time periods – prelim look Monday; if we like it, then revise paper accordingly; add seasonal size composition data	Seasonal size composition data	Add seasonal size composition data	No revisions suggested.

Table 4. Continued.

Criterion	TWN LL (TWNLL)	Japan DWPL (JPN PL)	USA LL-DS (USALL)	EPO Troll/PL (EPO LTR)
Spatial distribution (latitude, longitude)	145°E-130°W, 25-40°N – Area A 130°E-110°W, 0-25°N – Area B+C	10-55°N, 130°E-175°W	DS - S of 30°N, 180°-140°W SS - N of 25-30°N, 140-175°W	30-50° N, 120-130°W
Size/age range	60-115 cm – Area A (Group 1) 80-130 cm Areas B+C (Group 2)	Smaller average sized fish, range 50-100 cm; peaks vary by quarter	Deep set: range 80-125 cm, peak 110 cm Shallow set: range 60-125 cm, peak 85 cm	Range 50-90 cm, peak at 65 cm, secondary peak at 77 cm
Fishing ground map	Maps provided in supporting WP	Maps provided in supporting WP	In presentation – WP to come	Maps provided in supporting WP
Relative contribution to catch	>0-10%	14-67%	<1%	5-40%
Temporal coverage of data	1995-2011	1972-2012	1991-2012	1966-2011 – CPUE
Temporal consistency (seasonal/longer term)	Seasonal fishery in Q1/Q4; whole fishery southward shift over long term, but albacore targeting sets relatively constant in area	Seasonal fishery, primarily Q2/Q3; Q3 catches more fish in 50-60 cm than are caught in Q2	Seasonal fishery, primarily Q1 and Q4 for ALB; fishing grounds within shallow set and deep set relatively consistent	Seasonal fishery, primarily Q3; operation changes noted from coastal to offshore then back to coastal
Temporal consistency in size composition	Data prior to 2003 are not considered representative of size composition of catch; 2003 onwards data are considered representative	Seasonal changes between Q2 and Q3; large fish in Q2 in 1970s and early 1980s not seen later; may be related to change in fishing grounds but no way to check	Seasonal consistency in size comp within each fishery type (shallow and deep set) Deep set stable over long term, shallow less so due to other factors (regulations)	Size composition consistent throughout time series
Targeting	Group 1 target albacore and these sets primarily in Area A; Group 2 target bigeye and these sets largely in Areas B+C	DW fleet targets ALB	Non-target for both components	Target species
Catchability Changes	Group 1 (albacore targeting sets) catchability is relatively constant	Shift of fishing area from east to west; Shift in late 1970s-early 1980s	Yes – shallow set regulations affect catchability 2001-04 (ban) and changes in gear and fish locations permitted after 2004; impact of regulations on deep set needs study.	Change in fishing grounds; CPUE series broken up to reflect changes (3 time periods);

Socio-economic factors	Development of deep set bigeye fishery around 2000 – some vessels switched but not clear if was profitable/least profitable ALB vessels	Vessel size changed in 1970s (increased); 1980s licencing change 5 PL vessels retired for each new PS vessel; demand increased for fresh sashimi	Regulation changes	Lack of fishing regime under bilateral treaty in 2012 affects CPUE; US fleet underwent reduction in 1980s-1990s; salmon fishery affects this fishery as many vessels are salmon troll vessels
Supporting Working Paper	ISC/13/ALBWG-03/01	ISC/13/ALBWG-03/03	None - To be completed for assessment workshop in April 2014	ISC/13/ALBWG-03/06
CPUE Decision – preliminary	Use as sensitivity run	Main juvenile index in base case model; need to decide whether index based on all seasons or Q2 only	Use deep set as sensitivity run as has alternate trend in 2000s; shallow set component not used at all.	Use coastal index in sensitivity run as juvenile index
Rationale	Large spike in CPUE (for Group 1) in late 1990s at beginning of time series, may be related to concentration of effort into small spatial area and inability to remove catchability change during standardization. Needs further investigation. Trends consistent with JPN LL-large in 2000s	Shows coherence with longline index; lower variability than EPO troll; covers large spatial area and temporal period and captures main juvenile size classes; not affected by target switching to SKJ since based on DW vessels. Fishing grounds relatively constant over time series	Relatively small spatial scale and probably on edge of adult distribution so may not be representative of whole stock; regulation changes affected shallow set component and may have affected deep set component.	Index based on small coastal area with high concentration of effort; affected by both stock abundance and migration rate from WCPO and less representative of stock as a whole. Cannot account for migration rate in standardization. Assessment model is not spatially-explicit.
Best Available Science Information (BASI) Development in Working Papers				
Fishery description	Extensive description of albacore-targeting (Group 1) and non-targeting (Group 2) components of fishery in terms of catch, effort, season, geographic area, hooks per basket, and size composition of catch (ISC/13/ALBWG-03/01).	Described in terms of historical catch, effort, size composition, seasonal distribution of fishing grounds, and potential target species (PTS). PTS is the species for which the expected probability of catch is high. (ISC/13/ALBWG-03/05)	Presentation only (see Section 5.5 in this report).. Working paper to be completed and evaluated at stock assessment workshop in April 2014.	Fishery described in terms of annual catch, effort, spatial strata, and operational characteristics (ISC/13/ALBWG-03/06).

Analysis	Cluster analysis using logbook data used to define Group 1 and Group 2 sets. Similar sets grouped into three areas. Discriminant analyses conducted to verify the grouping of catch data obtained from cluster analyses, and to define the albacore-targeting and non-albacore-targeting fisheries. GLM with year, season, area, and interaction terms used to standardized CPUE (ISC/13/ALBWG-03/01)	Delta-lognormal model used for standardization. Explanatory variables include year, quarter, area (5° x 5°) and vessel ID (to address vessel effects on CPUE).		Data filtered to remove catches without position information and apparent catches on land. Also spatial blocks with less than 3 boat days of effort were also removed from the data set. Standardized CPUE estimated with GLM using eight regions and three time periods. GLM run for each region and time period separately and also for coastal and open ocean areas. (ISC/13/ALBWG-03/01)
Statistical results	Hierarchical cluster tree provided as well as tabular results of cluster analysis. Classification table of discriminant function results also provided showing that correct classification to two groups is high. ANOVA table of GLM results also provided (ISC/13/ALBWG-03/01)	ANOVA tables provided for both components of delta-lognormal model (ISC/13/ALBWG-03/03)		Graphical output only. GLM ANOVA table and other supporting statistical output not provided in working paper.
Nominal and Standardized Index	Nominal and standardized CPUE compared in Figure 8 (ISC/13/ALBWG-03/01)	Nominal and standardized CPUE values in separate plots (ISC/13/ALBWG-03/03)		Both nominal and standardized indices compared for all combinations.
Diagnostic plots	QQ or residual plots of standardized index not provided in working paper	Residual plots of each component in the delta-lognormal model provided as well as leverage plots of the impact of each explanatory variable on CPUE. (ISC/13/ALBWG-03/03)		Diagnostic plots (e.g., QQ, residuals) not provided in working paper.
Point estimate and variability in index values described	Point estimate of standardized index values provided in tabular format with estimated standard error for each annual value (ISC/13/ALBWG-03/01).	Point estimates of annual standardized CPUE values and estimated standard error provided in tabular and graphical formats (ISC/13/ALBWG-03/03)		Point estimates of standardized CPUE along with estimated standard error of annual values provided in tabular format (ISC/13/ALBWG-03/01)
Working Paper Revisions	Split catch and size composition data into Groups 1 and 2	Compare Q2 to all seasons	Working paper to be prepared for April 2014 assessment workshop	Revise to include stat results and diagnostic plots

Table 5. Preliminary parameterization of the base case model for the 2014 stock assessment of north Pacific albacore.

Parameter	Previous assessment	Tentative value	Notes
Model period	1966-2009	1966-2012	The WG noted the JPN LL-L index starts in 1975 and the JPN PL index starts in 1972, so the WG will have to investigate if it is appropriate to start in 1966
Stock structure	Single, well-mixed stock	Single, well-mixed stock	
Natural mortality	0.3 yr^{-1} for all ages	0.3 all ages, Lorenzen with 0.3 yr^{-1} for adults (see Brodziak et al. 2011a), M vector for south Pacific albacore	The WG noted that there are several alternatives for estimating M and that these procedures should be investigated before the assessment
Growth	VBGF, estimated inside model	VBGF, estimated inside model; alternatives- fix growth based on Wells et al. (2013) or Chen et al. (2012).	The WG will try to obtain more otolith aging data from the Chen et al. (2012) study and aging error from the aging workshop
Stock-recruitment	Beverton-Holt, steepness = 1	Beverton-Holt, steepness = 0.9	Based on the midpoint value between two studies (Brodziak et al. 2011b; Iwata et al. 2011) on albacore steepness (0.95 and 0.85)
Maturity	50% at age-5, 100% at age-6	50% at age-5, 100% at age-6	Ueyanagi (1957); Chen et al. (2010)
Length-weight	Seasonal length weight relationships from Watanabe et al. (2006)	Seasonal length weight relationships from Watanabe et al. (2006)	
CV of indices	Minimum CV of 0.2	Additive constant to CV to make average CV of an index to be 0.2	This is the initial CV of the index, which may be re-weighted relative to other indices, depending on model fits
Size composition effective sample size	Based on number of trips for USA LL and EPO TR, other fleets are adjusted so that the average sample size is equivalent to USA LL and EPO TR. Further down-weighted by lambda of 0.01	Same as previous assessment but set maximum sample size to 30 to 50; or use Beverton-Holt function to make input sample size asymptotic. Initial sample sizes for fleets should be scaled with a multiplier so that the average is equal to the USA LL and EPO TR fleets	Lower effective sample size than in 2011 in order to avoid down-weighting of size composition data.

Table 6. List of sensitivity model configurations for 2014 stock assessment of North Pacific Albacore tuna.

Sensitivity run	Alternative assumption	Justification	Comments
Natural Mortality	Vector of age specific M for south Pacific albacore	model performance	
Natural Mortality	Range between 0.3 and 0.4	range of uncertainty	
steepness	Range 0.75-0.9	range of uncertainty	
steepness	1.0	Comparison to past assessment	
Growth form	Two alternative growth forms (Suda, Taiwan – Chen et al. (2012)	model performance	Evaluate importance of composition data on scale
Alternative CPUE	USA LL, TBD	model performance	
Starting years	1952, 1975, 1993	model performance	
Fit to equilibrium catch	Average pre-1966	model performance	
Drop Juvenile CPUE	PL, Troll, Small longline	model performance	Minimize influence of missing movement process on estimated dynamics
Selectivity	All domed	model performance	Evaluate influence of selection assumption

Table 7. Initial parameterization of the ASPIC production model discussed by the ALBWG.

Parameter	**Parameterization**
First year in model	Two periods: 1975-1992 and 1993-2012
Last year in model	2012
Data series	JPN LL-L1 (1975-1992), JPN LL-L2 (1993-2012)
Program mode	FIT (use in case of single index), and BOT (use after converged in FIT mode)
Model shape	Generalized (Pella-Tomlinson)
Optimization Model	Conditioned on Yield
Objective function	SSE
Generalized Model parameter	PHI MIN (20), PHI MAX (30), PHI step size (5), PHI start value (25) (recommend), PHI = Bmsy/K*100
Bound Multiple	8.0
Monte Carlo	unable
B1/K	0.3, 0.4, 0.5, 0.6, 0.7 for initial value, Estimate
MSY	Value of about 90,000 t for initial value
K	Initial value: 850,000 mt, Estimated
Series type	CC but use number based on CPUE directly.
q	small value (1.8×10^{-6}) for initial value, Estimate

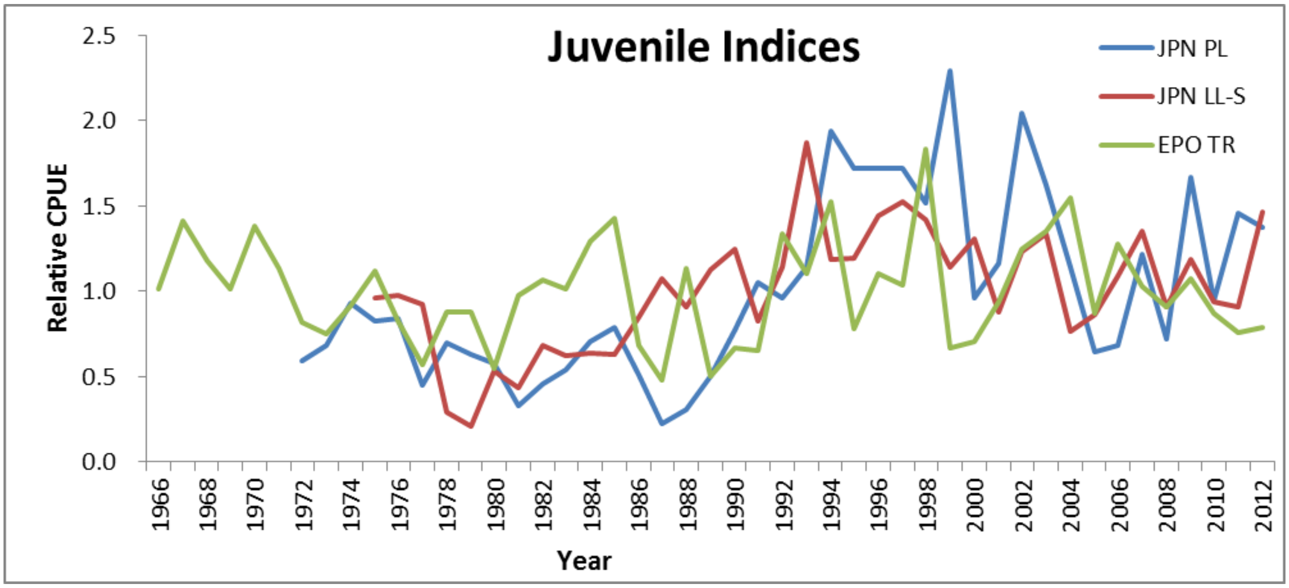

Figure 1. Comparison of abundance indices capturing juvenile north Pacific albacore. Values for each index are shown relative to the median of each time series to remove scaling effects. See Table 4 for index descriptions.

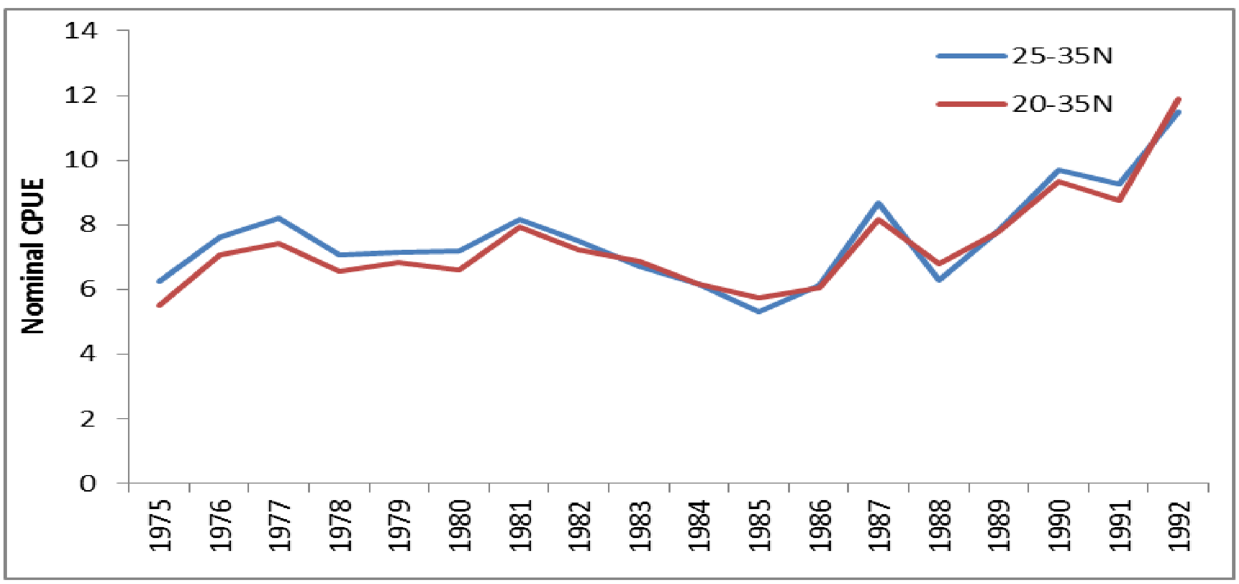

Figure 2. Comparison of the JPN LL-L CPUE index for 1975-1992 standardized using data from 20-35°N and data from a smaller latitudinal band between 25 and 35°N.

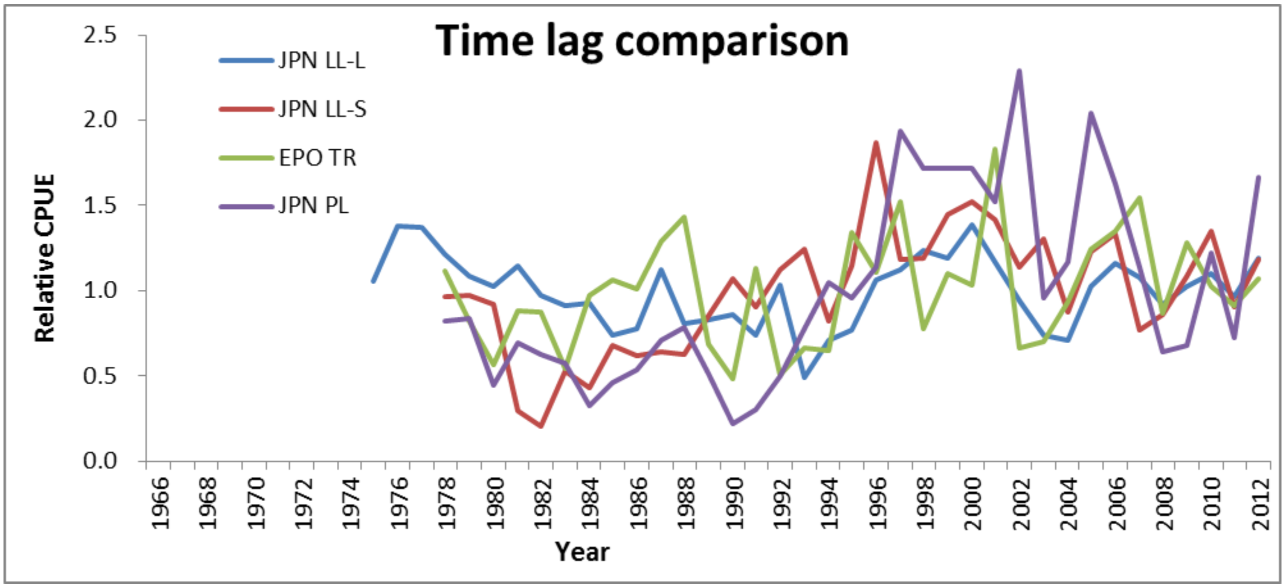

Figure 3. Comparison of primary juvenile (JPN PL, EPO LTR, JPN LL-S) and adult (JPN LL-L) indices with juvenile indices lagged relative to the adult index to assess temporal coherence. Values for each index are shown relative to the median of each time series to remove scaling effects. See Table 4 for index descriptions.

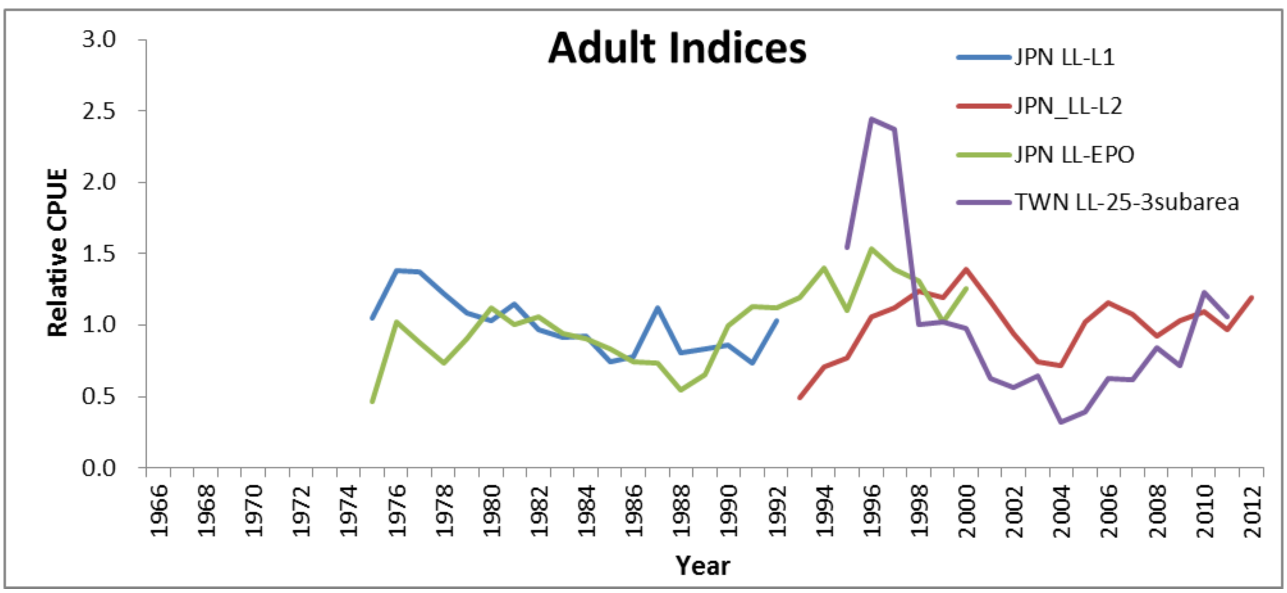

Figure 4. Comparison of Japan and Taiwan long line indices capturing adult north Pacific albacore. The Taiwan index is based on a three subarea model and includes data from north of 25°N in the index. Values for each index are shown relative to the median of each time series to remove scaling effects. See Table 4 for index descriptions.

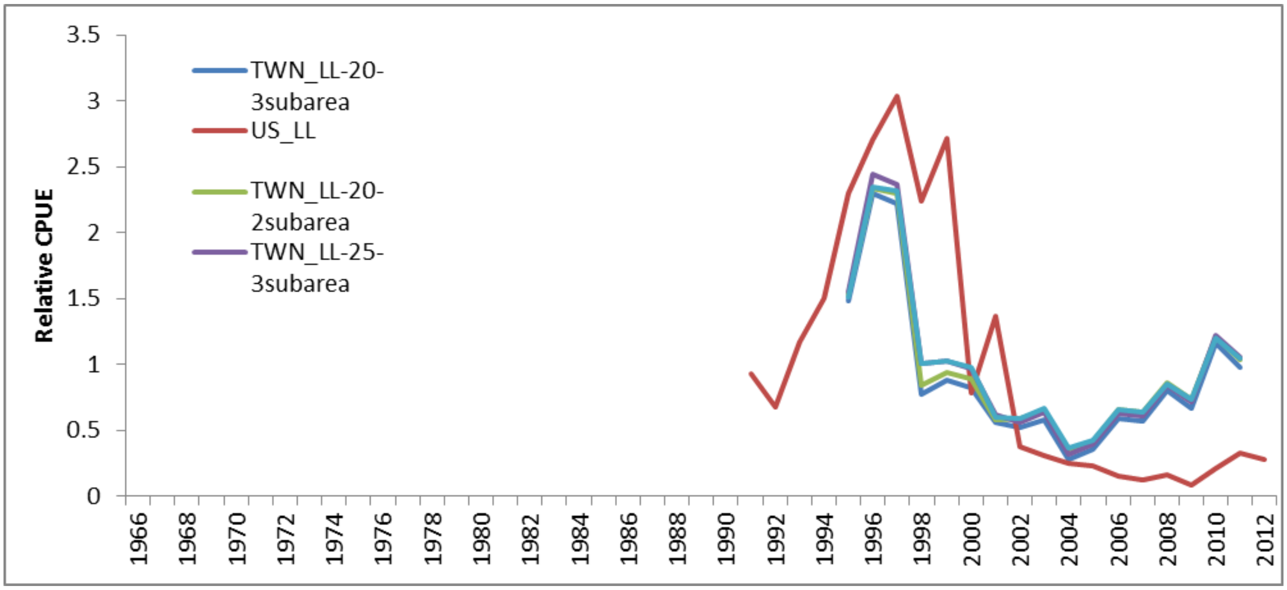

Figure 5. Comparison of Taiwan and USA deep set longline indices. Values for each index are shown relative to the median of each time series to remove scaling effects. Several formulations of the TWN LL index are shown based on the dividing latitude for areas (20 or 25N) and the use of three subareas (A, B, C) or combination of Areas B+C (2subarea). See ISC/13/ALBWG-03/01 for detailed explanations.

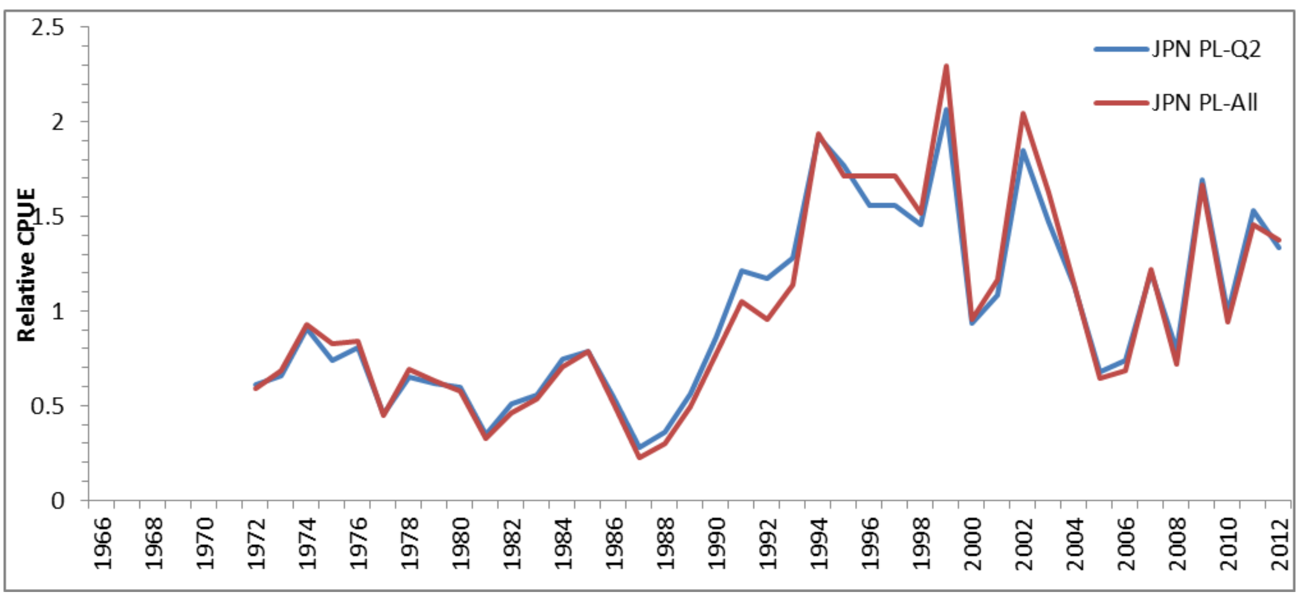

Figure 6. Comparison of JPN PL CPUE index standardized with data from the second quarter (Q2), the primary catch period, and all seasons. Values for each index are shown relative to the median of each time series to remove scaling effects.

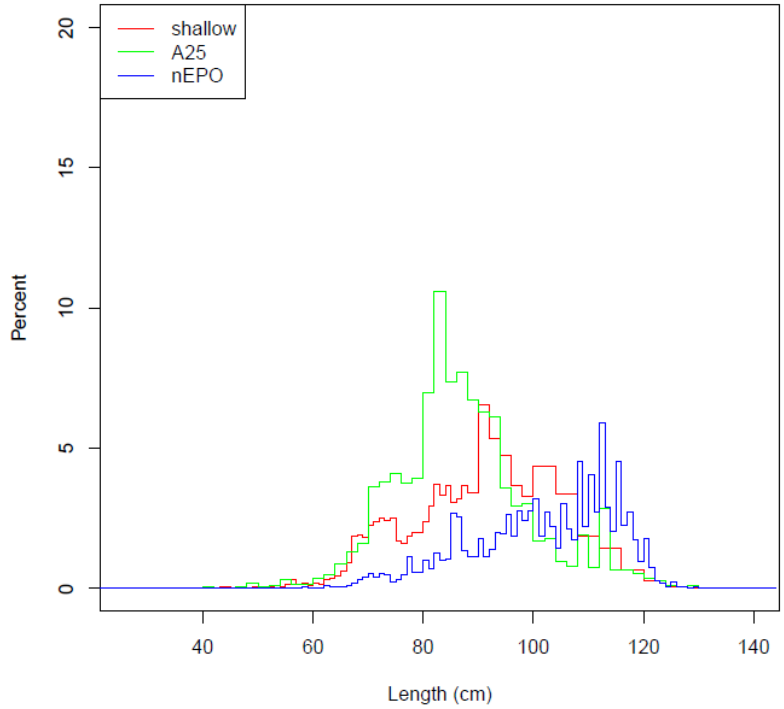

Figure 7. Comparison of size composition data collected from the shallow set USA longline fishery (shallow), albacore targeting sets north of 25°N of the Taiwan longline fishery (A25), and the Japan EPO longline fishery north of 25°N (nEPO). Data from all seasons combined.

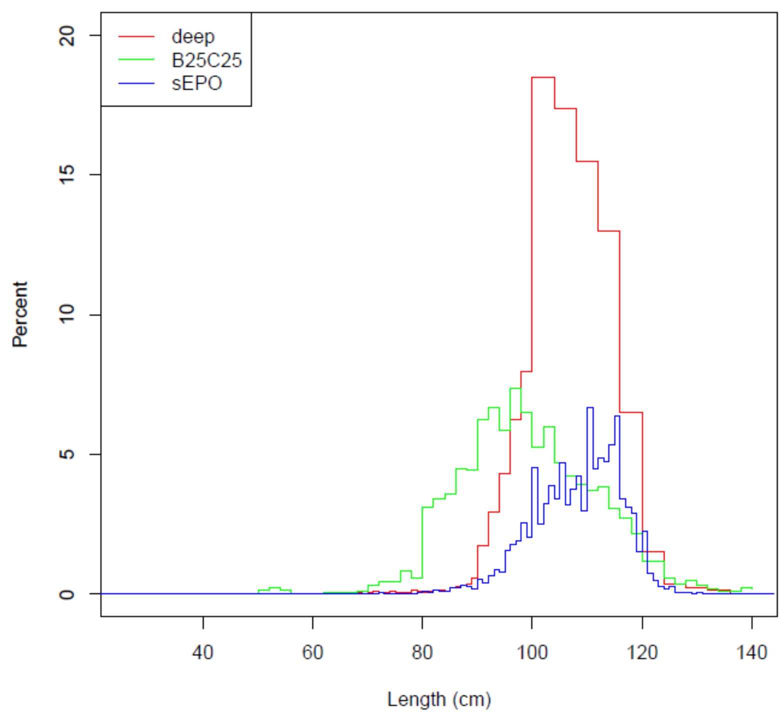

Figure 8. Comparison of size composition data collected from the deep set USA longline fishery (deep), non-albacore targeting sets in Areas B and C south of 25°N of the Taiwan longline fishery (B25C25), and the Japan EPO longline fishery south of 25°N (sEPO). Data from all seasons combined.

ATTACHMENT 1

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ATTACHMENT 2

ALBACORE WORKING GROUP (ALBWG)
INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC OCEAN

INTERSESSIONAL WORKSHOP

5-12 November 2013
NRIFSF, Shimizu, Japan

***Revised* Agenda**

1. Opening of the Workshop
    - Welcoming Remarks
    - Chair's Remarks (context, objectives, outputs)
    - Meeting Arrangements
    - Introductions
2. Meeting Logistics
    - Meeting Protocol
    - Review and Adoption of the Agenda
    - Assignment of Rapporteurs
    - Group Photo
3. Distribution of documents and Working Paper Availability
4. Review of Information Needs Supporting Fishery Definitions and CPUE Indices
    - Information Needs (March 2013 workshop)
    - Criteria used to assess strength/weaknesses of indices
5. Fishery Definition and CPUE Index Work Assignments
    - JPN LL
    - TWN LL
    - USA LL
    - JPN PL
    - CAN/USA troll
    - China LL
6. Input Data Review for conflicts
    - Catch data
    - CPUE
    - Size composition
7. Assessment of CPUE indices against criteria adopted at the March 2013 workshop
8. Model fitting principles
9. Weighting of input data types
    - 2011 approach
    - Alternative approaches

10. Catchability
    - Fixed assumption
    - Time-varying
11. Base case scenario: Assumptions and rationale
    - Model period – 1966 to 2011, 2012
    - Structural assumptions (one-stock, etc.)
    - Biological parameter estimates
    - Natural mortality, M
    - Growth curve
    - Maturity schedule
    - Fishery selectivity
    - Primary abundance index/indices for fitting
12. Other modelling scenarios
    - Alternative selectivity assumptions
    - Initial conditions
    - Other possibilities?
13. Sensitivity analyses
    - Natural mortality
    - Steepness of stock-recruitment relationship
    - Growth Curve Sensitivity (k)
    - Maturity
    - Weighting of size and CPUE series
    - Inclusion of secondary CPUEs
    - Size of equilibrium catches relative to base case
    - Effective sample size
14. Projection scenarios
    - Requests from NC9
    - Update reference point information requested by NC8
15. Assessing Stock Status

15bis Alternative modelling approaches

16. Recommendations
    - Stock Assessment
    - Data format and submission deadlines
    - Diagnostic tools
    - SS3 Version for Stock assessment
    - Research
17. Work plan and assignments for stock assessment workshop
18. Other matters
    - Time and place of next meeting
19. Clearing of Report
20. Adjournment

ATTACHMENT 3

List of Working Papers

WP Number	Title and Authors	Availability
ISC/13/ALBWG-03/01	Taiwanese albacore-targeting longline fisheries in the North Pacific Ocean, 1995-2011. Chiee-Young Chen and Fei-Chi Cheng	Public
ISC/13/ALBWG-03/02	Abundance indices of albacore tuna by Japanese longline fishery in the north Pacific Ocean. H. Ijima, H. Okamoto and H. Kiyofuji.	Public
ISC/13/ALBWG-03/03	Standardized CPUE for North Pacific albacore caught by the Japanese pole-and-line fisheries from 1972 to 2012. H. Kiyofuji and H. Ijima.	Public
ISC/13/ALBWG-03/04	Vertical and horizontal changes of north pacific albacore derived from archival tag data. H. Kiyofuji, S. Okamoto, and H. Ijima.	Public
ISC/13/ALBWG-03/05	Fishery definition for Japanese longline and pole-and-line for North Pacific albacore. Keisuke Satoh, Hidetada Kiyofuji, and Hirotaka Ijima.	Public
ISC/13/ALBWG-03/06	An update of standardized abundance index of US and Canada albacore troll fisheries in the North Pacific (1966-2012). Yi Xu, Steven L.H. Teo, and John Holmes.	Public
ISC/13/ALBWG-03/07	Revised historical catch and CPUE of albacore tuna by Korean tuna longline fishery in the North Pacific Ocean. Sang Chul Yoon.	Contact details
Presentation	USA Longline Fishery and Abundance Index . Steve Teo and Kevin Piner.	
Presentation	Stock-recruitment-environmental relationship for North Pacific albacore (*Thunnus alalunga*). Hidetada Kiyofuji.	