ANNEX 6

REPORT OF THE BLUEFIN TUNA WORKING GROUP WORKSHOP

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

(April 16-23, 2007, Shimizu, Japan)

1.0 INTRODUCTION

The ISC Pacific Bluefin Tuna Working Group meeting was held in Shimizu, Shizuoka, Japan during 16-23 April 2007. This was the fifth meeting of this Working Group since its inception in 2000.

Scientists from Chinese-Taipei, Japan, U.S.A., and IATTC participated in the meeting (Appendix 1). Twenty-seven working documents (Appendix 2) were available for review by the participants.

1.2 Opening of Meeting

Dr. Tokimasa Kobayashi, the Director of the National Research Institute of Far Seas Fisheries, welcomed the participants. He wished the participants success in completing their work and reminded them to enjoy attractions of historical Shimizu when their have free time.

1.3 Election of Chair

Harumi Yamada, Chair of the PBFWG, announced that he needed assistance with conducting the meeting and nominated Dr. Naozumi Miyabe (Japan) to chair the meeting. Dr. Miyabe was unanimously elected chairman for the meeting.

Dr. Miyabe called upon Yukio Takeuchi to provide background information on the objectives of the current and July 2007 meetings of the PBFWG. Takeuchi explained that the last bluefin stock assessment conducted by the PBFWG in January 2006 revealed uncertainties and flaws, including discrepancies between Japanese historical longline CPUE and other Japanese longline data, possible errors in estimating the age of large-sized fish from growth curves, likely errors in the estimation of some Japanese catches, etc. The condition of the stock for the 1950s to the 1980s, therefore, was uncertain. Nevertheless, the WG provided results that showed the 2001 year class to be strong, perhaps exceptional although poorly estimated. If this year class is as strong as estimated, it is projected to increase the spawning stock by 2010 even with the recent fishing mortality. However, because of the large uncertainty with the stock assessment, the ISC6 Plenary concluded that the WG's projection was an over optimistic view of the bluefin tuna stock in view of overall stock condition and uncertainty in the size of the 2001 year-class.

The Plenary also requested a re-valuation of the effect of different biological parameter estimates and corrections to the early catch data on the assessment results.

In order to address these issues, two intercessional meetings in 2007 are being planned. The objective of the first meeting is to clarify and address issues identified by the ISC6 Plenary, or at a minimum, identify future tasks that will explore the uncertainties. The second meeting in July will concentrate on updating information relevant to the stock condition and review work assignments to be completed before the next stock assessment is undertaken,

1.4 Agenda

A draft agenda was reviewed and adopted with minor modification (Appendix 3).

1.5 Appointment of Rapporteurs

The following participants served as rapporteurs:

Sections 1, 2, 3 Kotaro Yokawa
Section 4 Harumi Yamada
Section 5:
- 5.1 Review of historical catch data in pre-assessment period in both side of the Pacific Humihito Muto
- 5.2 Japan’s Catch and Size Harumi Yamada, Mikihito Kai, Humihito Muto
- 5.3 Chinese-Taipei’s Catch and Size Hitoshi Honda
- 5.4 EPO Catch and Size Alexandre Aires-da-Silva
- 5.5 CPUE Momoko Ichinokawa, Chien-Chung Hsu

Section 6 Toshiyuki Tanabe and Tomoyuki Ito
Section 7 Ray Conser and Yukio Takeuchi
Section 8 Kevin Piner
Section 9 Kotaro Yokawa, Gary Sakagawa, Naozumi Miyabe and Yukio Takeuchi

2.0 UPDATE OF FISHERY STATISTICS (DESCRIPTION OF RECENT DEVELOPMENTS AND ISSUES OF FISHERIES.)

2.1 Fisheries reports by Members

Fisheries reports were provided by participants and were reviewed by the WG.

Japan (ISC/07/PBF-1/01)
Presented by Harumi Yamada.
Japanese annual catch estimates for Pacific bluefin tuna (PBF) were revised for the period 1952 – 2006, based on statistics from the SID report, a large-scale research program, Research on Japanese Bluefin tuna (RJB), and Japan Fisheries information center (JAFIC). According to the estimates, annual total catch of PBF has fluctuated markedly between about 6,300 metric tons (t) and 33,000 t. The recent historical low catch of 6,300 t was in 1990, from which it recovered

to about 21,000 t in 2005. About 60 percent of the annual catch is taken by purse seine gear. There are two types of purse seine fisheries: the tuna purse seine fishery in the Pacific and the Sea of Japan and small pelagic fish purse seine fishery in the East China Sea. The catch series of the tuna purse seine fishery of the Pacific was raised to total catch using a conversion factor for the "Maguro" category. The conversion factor was necessary because the original measured catch at the unloading sites was gill-and-gutted weights. The total purse seine PBF catch ranged between 1,000-25,000 t and has been highly variable. The annual catches of longline, troll and set net have each been around 300-6,000 t, and the catches of the pole-and-line, drift-net and handline fisheries have been relatively minor in recent years.

Discussion:
The WG discussed the adequacy of the method to estimate species composition. Catches of small bluefin tuna in various coastal fisheries are included in the catch of similar sizes of other tuna species in the SID report. The amount of small PBF in this catch was estimated by applying the annual ratio of PBF catch to other tuna species catch which is available for larger tunas caught by the coastal fisheries and reported for gear and at the prefecture level. Because this ratio was based on the catch of large-sized tunas and not small-sized tunas, the WG noted that a better estimation procedure for species composition for the small-sized tuna catch be investigated. The WG also noted that the investigation may conclude that the current procedure is the best available.

Chinese Taipei (ISC/07/PBF-01/23)
Presented by Chien-Chung Hsu:
The historical Pacific bluefin tuna catches for Chinese-Taipei were revised by the Oversea Fisheries Development Council (OFDC) based on three sources: Year Books, Taiwan Area; trade reports of Fishermen's Association; and logbooks. These data sources were for different time periods and contain different catch information at different stages. For Category I and II data, logbooks are available since 2001 for the small-scale longline fishery but the coverage rate was low. Logbooks are also available for the period, 1986-1992 for the large-scale pelagic drift net fishery, and since 1988 for the purse seine fishery. Trade reports of Fishermen's Association can provide accurate landings by species; however, information from this source is only available for the past five years. Year Books, Taiwan Area are published by the Taiwan Fishery Agency and contain the most complete catch and effort information for Taiwanese tuna fisheries and are available since 1965.

The revised catch data were extracted mainly from Year Books, Taiwan Area, and for four fisheries – the longline fishery from 1965, the purse seine fishery from 1982 to 1993, the large-scale pelagic drift net fishery from 1982 to 1992, and the other gears, including set net, trap, handline etc., fishery from 1983.

For Category III data, Pacific bluefin tuna size frequency and biological sampling was established since 1993 by a research program supported by National Science Council to National Taiwan University, and recently, with the OFDC involvement. Sampling is for the longline PBF catches only. No biological sampling is conducted for the other fisheries.

Discussion:

Although the Chinese Taipei fisheries are conducted largely off Taiwan, some of the longline vessels operate around Palau and Guam and land PBF in Taiwan; consequently, there is a chance that some of the PBF landings were taken in the Palau or Guam regions. Catches from those regions have been recorded by Japanese longline vessels and such information can provide insights into the movements of PBF. A question was raised about the marked increase in catch in the late 1990s by the longline fishery. No definitive answer was available, but it was speculated that market conditions provided the incentive for increased targeting on PBF.

Questions about the Chinese Taipei purse seine catches were raised. There was no significant information on catches for this gear.

Mexico (ISC/07/PBF-1/22)
Introduced by Kotaro Yokawa, on behalf of Mexico
The Mexican fleet has a history of catching Pacific bluefin tuna. Recently there has been increased interest in this resource for pen rearing (fattening) and export to the Japanese market in particular, resulting in increased targeting of PBF in Mexican waters. The vessels catching bluefin tuna are the same vessels that target yellowfin tuna (*Thunnus albacares*). The carrying capacity or tuna purse seine fleet size of Mexico, therefore, has not increased to exploit this PBF resource. The vessels typically fish for yellowfin tuna and shift to bluefin tuna fishing when it is economically viable to do so. The catch in 2006 was estimated to be 9,789 t.

*Discussion: (*Also see discussion for EPO)

Although there has not been an increase in carrying capacity or fleet size of the Mexican purse seine fleet, fishing activity for PBF has increased. Market demand for pen-reared fish appears to be the reason for this increased fishing.

The mean size of the PBF caught in this fishery in 2006 was questioned. The WG noted, as stated in the Mexican report, that larger-sized fish are preferred for pen rearing and the sizes of fish delivered to pens are not measured at the time of placement into the pens. The average size of 80 cm FL for the 2006 catch was speculated to be an underestimate. The WG recommended that this matter be investigated through proper size sampling of fish delivered to the pens as well as with sampling of fish killed and delivered for other uses, i.e. canneries.

USA (ISC/07/PBF-1/19)
Presented by Ray Conser:
Pacific bluefin tuna catch estimates from U.S. fisheries were summarized from various sources and made available to the working group. Annual and quarterly estimates were provided for the period 1918 to 2004. Fishing gear identifiers were by commercial and sport gear only for the period 1918 to 1980. A finer division of commercial catch estimates by gear (pole and line, gillnet, purse seine, troll/handline, was provided for 1981-2004. During the period 1918 to 2004 the bluefin tuna commercial catch peaked in 1966 at 15,920 t and has decreased to a low of 11 t

in 2004. Some of the commercial purse seine catch in 1995 to 2003 was sold to operators of pen rearing interests in Mexico. Recreational catches increased during the period 1999 to 2003, before declining to their lowest level in 2004 of only 34 t. Logbook and length frequency data for U.S. purse seine gear are provided to the working group by the IATTC.

Discussion:

It was pointed out that most of the U.S., catch was made in quarters 2 and 3 before 1947. It then shifted to quarter 3 for most years thereafter. The reason is not clear, but appears to be related to a temporal shift in effort, owing to changes in the market, and/or environmental condition.

2.2 Catch Statistics

The Working Group revised and up-dated the table of Pacific bluefin tuna catches (Table 1) from information provided at the Workshop. Fishery categories for reporting of catches were also revised to correspond to elements in the stock assessment model. No information was received from Korean scientists on recent catches for Korean fisheries. Ad hoc estimates for Korean fishery catches were, therefore, prepared using catch certificates of Japanese PBF imports from Korea. Similar estimates were prepared for other countries for which independent catch statistics are not available. Such estimates are considered minimum estimations and amount to a few tons.

3.0 REVIEW OF HISTORICAL FISHERIES DATA

3.1 Review of historical catch data in the pre-assessment period on both sides of the Pacific

Presented by Fumihito Muto:
The total Japanese catch for the first half of the 20th century is not available in the existing national statistics for Japan, but several data sources contain detailed catch information. Catch amount data of Pacific bluefin tuna were found for some part of this period for Aomori, Toyama, and Hokkaido Prefectures. Also, Japan's national statistics in this period had catch statistics of "tunas NEI" for all tuna species except "skipjacks and bonitos", and from this data, PBF catches were partially estimated by using species-component in tuna catches in 1951, with the information of the biological distributions of tunas, and the historical accounts of fisheries by area. By aggregating detected and estimated information, Japan's PBF catches in that period were at least 1,500 – 18,000 metric tons annually. The catch level was comparable to the recent catches in Japan and the U.S.A. for the same period. Catch amounts in that period had a large fluctuation, with at least 2 peaks, and the 2nd peak was larger and more remarkable. The amount of PBF caught off the south eastern coast of Taiwan in 1935-1940 was also partially estimated from Japanese literature.

Discussion:

The relationship between the number of motorized vessels and the PBF catch was discussed. It was clarified that the term "motorized vessels" in the document refers to all types of motorized fishing boats and not only tuna fishing vessels. Such data were available for each prefecture. The increase of catch coincided with the development of the tuna driftnet fishery in Kushiro (Hokkaido Pref.), and according to a fisherman's personal publication (Saga 1928), it started by motorization of fishing vessels in 1920s. The WG pointed out that the peak period of PBF catches in the 1930s around Japan occurred about the same time that there was high abundance of several other pelagic fishes, such as Japanese sardine (*Sardinops melanostictus*) and California sardine.

3.2 Review of historical catch data in the assessment period (1952 onward)

3.2.1 Japan

<u>3.2.1.1</u> Quarterly catch data

Troll (ISC/07/PBF-1/02)
Presented by Harumi Yamada:
The annual Pacfic bluefin tuna catches by troll gear for 1952-2002 were estimated from Japanese official fisheries statistics (SID report). Catches of bluefin tuna are included in the SID reports under 'bluefin tuna' and 'small tunas' categories. The PBF catch in the 'small tunas' category was estimated by applying the proportion of Pacific bluefin tuna in the portion of catch that was reported by species and by year and landing prefecture. The

estimated total Pacific bluefin tuna catch by year was then segmented into quarters by year using ratios from the RJB data base. Because the RJB data base began in 1994, segmentation for earlier years, 1993 and earlier was based on the aggregated 1981-1993 auction records from the Nagasaki prefecture only. The Nagasaki prefecture troll catch amounted to 53-83 % of the entire Japanese troll catch for this period. It was noted that applying this 1981-1993 average ratio to early years is problematic because there was large variability in the average ratio.

Discussion:

The WG suggested that a better ratio for segmenting the annual catch into quarters for years prior to 1981 might be the average quarterly catch ratio for the entire 1981 – 2006, series of data. The WG also suggested that sensitivity analysis be performed to assess the effect of this alternative average ratio.

Set net (ISC/07/PBF-1/06)

Presented by Mikihiko Kai:

The study was based on catch data of Pacific bluefin tuna ("Maguro" and "Meji") collected by SID for 1952-2004 and the RJB program for 1994-2006. The quarterly catches were estimated by multiplying annual catches from four areas in the SID report by proportion of quarterly catches from the same four areas in the RJB report. Results indicated that the annual proportion of catch of "Meji" to the catch of "Maguro" and "Meji" was not constant but quite variable; suggesting that recruitment of Pacific bluefin tuna had fluctuated yearly for the 1994-2006 period.

Discussion:

The WG pointed out that the proportion of annual catch of "Meji" from the RJB program for 1995, 2002, 2003 and 2004 to that from the SID report was unusual and did not follow the pattern for the other years. The WG suggested that researchers should obtain information on the sizes of fish in the "Maguro" and "Meji" categories and from various ports identified in both the SID report and RJB program.

Tuna purse seine (ISC/07/PBF-1/10)

Presented by Yukio Takeuchi:

Quarterly catch estimates of Japanese purse seine primarily targeting large-sized Pacific bluefin tuna and operating in the north western Pacific and in the Sea of Japan were updated using logbook data from 1971 to the present. Quarterly catch prior to 1971 was estimated using average quarterly catch proportions from 1971 to 1975. Separated quarterly catches were also estimated by size categories of Pacific bluefin tuna in the market (large sized and small sized) using reported catch in weight by size categories (larger than or smaller than 10kg in body weight) in logbook data. Closer inspection of the data revealed that the annual catch of large-sized fish reported in the Japanese national statistics (SID) was not adjusted to round weight. Furthermore, the definition of size category in market (and in SID) is likely different from the definition of size category used in logbooks, although annual total catch of bluefin (including both large-sized and small-sized Pacific bluefin tuna) is estimated with good precision. Future work should focus on improving catch estimates by paying attention to differences in the definition of size categories.

Discussion:

The different definitions of size category between logbook and market, SID and RJB were discussed. The WG concluded that the apparent difference in definition of size categories should be investigated. Errors in estimating catches because of differences in definition were noted as not seriously affecting the performance of the stock assessment model.

Small pelagic fish purse seine (ISC/07/PBF-1/09)

Presented by Harumi Yamada:

Pacific bluefin tuna catches made by the small pelagic fish purse seine fishery operating in the East China Sea and Tsushima Straight are unloaded at ports mainly in northern Kyusyu Island and secondarily in ports of western Honshu Island facing the Sea of Japan. The quarterly catches for the period 1991 – 2006 were estimated by using landing data from Japan Fisheries Information Center (JAFIC) and the RJB program. JAFIC monitors landings in weight by month at ports in Kyusyu, and RJB monitors at ports in Honshu. Logbook data were available since 1994. The results indicate high catches in quarters 2 and 4 throughout the period.

Discussion:

A discrepancy of the estimated catch series between logbook data and other sources was discussed. In some years, differences of one thousand tons are observed in estimates from both landing data (this study) and logbook data. Annual catch trends from logbook data and landing data are similar, although both are underestimates of catches because the weight of fish in a box was under-reported at the auction sites. Reliability of the catch estimation should be evaluated. This could be done by collecting data on average weight of a box by size category; then total catch from this average weight and number of boxes can be computed and compared to the weight reported in the logbooks.

Pole and line (ISC/07/PBF-1/04)

Presented by Kazuhiro Oshima:

The quarterly catches were estimated by multiplying the quarterly proportions (calculated with the logbook data and the RJB data) by annual catch (derived from the SID report). The coverage of the logbook data used in this study exceeded 80% in most years. However, yearly variation of catch calculated using the logbook data differed from that of catch derived from the SID report. This study suggests that the catch data of Pacfic bluefin tuna in the logbook is of low reliability, although coverage rate of fishing effort is high, because the pole-and-line fishery targets mainly skipjack and albacore. Hence, ways to improve the reliability of the logbook data need to be investigated before reliable estimates of quarterly Pacific bluefin tuna catch can be estimated from the pole-and-line logbooks.

Discussion:

The WG pointed out that annual catch by vessel size category of pole-and-line vessels for the period 1954 – 1964 was not shown in the SID report. The WG also pointed out that concentrations of catch in a particular quarter observed in the logbooks for some years after 1990 and in the RJB database appear to be questionable. This is primarily because PBF is a bycatch for the Japanese pole-and-line fishery and the catch in recent years is small. The catch of this fishery, therefore, will have little to no influence on the stock assessment.

Longline (ISC/07/PBF-1/21)
Presented by Kazuhiro Oshima:
Quarterly catches for the longline fishery were estimated based on data from both the SID report and logbooks. Estimated catches in the 2nd quarter dominated in most years. This is the quarter when fishing operations targeted the spawning aggregations.

This study also revealed that data from the SID report gave a different estimate of annual Pacific bluefin tuna catch for the distant water and offshore longline fleets from logbook data.

Discussion:

The WG recommended that the catch be estimated in numbers of fish, not weight, because this is readily available from the distant and offshore longline fishery logbooks and it is the unit most easily handled by the stock assessment model, SS2. The WG also noted that catch in numbers for the coastal longline fishery is difficult to obtain because catches for this fishery are recorded in weight and available only in the SID report.

The WG pointed out that, judging from estimated catches in Table 2 of the document, the coastal longline fishery contributed the dominant share to the total Japanese longline catch for all years before 2001. Since 2001, however, the distant water and offshore longline fishery seem to have contributed the dominant share. This decline in dominance of the coastal longline fishery is apparently an artifact caused by revision of the vessel classification system since 2000. Catch tables revised since 2001 and with a compatible vessel classification system prior to 2001 will be presented at a future WG workshop.

3.2.1.2. Size data

Troll (ISC/07/PBF-1/03)
Presented by Mikihiko Kai:
Information on sizes of Pacific bluefin tuna caught by the Japanese troll fishery was compiled from length data collected by the RJB program from 1994 to 2006. Daily basis length-frequency distributions were compiled into quarterly distributions. Research results indicated that most of the Pacific bluefin tuna caught were less than 100 cm FL

and mainly in the 20-60 cm FL range. The length-frequency distributions vary among years and are influenced by yearly variability in recruitment strength.

Discussion:

Two length-frequency modes are present in the 1st quarter in some years. The WG speculated that one mode may be recruitment to the Pacific fishery and the other may be recruitment to the Sea of Japan fishery. The WG recommended that this be investigated by examining the size data from quarter 1 by fishery.

The WG also recommended that the length-frequency samples be weighted by the amount of catch of the sampled strata (e.g. area) before pooling into aggregated length-frequency distributions.

Set net (ISC/07/PBF-1/07)
Presented by Mikihiko Kai:
The length composition of Pacific bluefin tuna caught in the Japanese set net fishery was estimated. The study was based on length and weight data collected by the RJB program, 1994- 2006. The effect of season and area on the weight-length relationships was examined. Equations to convert round weight and gilled-and-gutted weight of fish to fork length were developed. These were used to convert weight frequency data into length-frequency distributions. Results indicated greater area effect than seasonal effect in the length-frequency distribution. Also, the distributions by quarter were variable, and caused by availability of different sizes of fish as influenced by environmental conditions.

Discussion:

Although the set net fishery catches a wide range of fish sizes, fish larger than 100 cm FL since about 2003 are of particular interest. The strong year class that was believed to have recruited in 2001 would be represented in these large fish. The WG recommended that this be investigated, including whether selectivity of the gear has changed since 2001 and by separate areas (fish caught by nets located in the Sea of Japan versus by nets located in the Pacific). The WG also recommended that the length-frequency data be weighted by the amount of catch of the sampled strata (e.g. area) before pooling.

Tuna Purse seine (ISC/07/PBF-1/08)
Presented by Yukio Takeuchi:
Size-frequency data from the Japanese tuna purse seine fishery in the north western Pacific Ocean and in the Sea of Japan were reviewed. Weight measurements taken from sales slips from 1952 to 1993 were tabulated. These measurements are grouped into 1 kg units and were obtained from markets on the Pacific coast. From 1994 and onward, another source of data was available. For this period, length measurements were collected from tuna purse seines operating in the north western Pacific and in the Sea of Japan. To develop a continuous time series of length-frequency distributions, the weight frequency data for years prior to 1994 were converted to length frequencies. A length-weight

relationship was used. It was developed from samples of length and weight data collected at the Shiogama market. The resulting time series shows a pattern of few fish less than 100 cm FL in the catches before 1974 as compared to a broad range of sizes of fish since about 1981. This difference may be an artifact owing to biased sampling toward larger fish in Tsukiji market where sampling was conducted or to poor recording of small fish in sales slips before 1974.

Discussion:

The reliability of the size data derived from sales slips was discussed. With the sales slip data recorded in weight and 1 kg units, the WG felt that the precision of the measurement was insufficient for the stock assessment task. The WG suggested that data prior to about 1986 not be used unless further investigation can find acceptable solutions for the flaws.

Small pelagic fish purse seine (ISC/07/PBF-1/09)
Presented by Harumi Yamada:
Fish auction records for 1997-2006 from three ports in Kyusyu I., where most of the catch by the Japanese small pelagic fish purse seine fleet is landed, were examined. The landings are not weighed. Instead, fish under 5 kg (round weight) are placed in standard-sized boxes according to size of fish. Boxes are assigned categories that roughly correspond to the size and number of fish in the boxes, i.e., the larger the fish in the box, the fewer fish in the box and the lower the assigned category. A sample of each box category was drawn and fish in the boxes measured to obtain a representative length-frequency distribution. For fish over 5 kg, the number of fish are recorded by weight ranges that changed over the time period. Nonetheless, length-frequency distributions of the catch were prepared for quarters of each year.

Quarterly landings of fish under 5 kg were estimated for each box category by multiplying the box category by the number of boxes. These estimates were then used to weigh the representative length-frequency distribution by box category before pooling the length frequencies over box categories. For landings of fish over 5 kg, number of fish was summed by weight bin class and quarter of the year. The midpoint of each weight bin was converted to length with a length-weight equation to represent the length of fish in the weight bin. Length-frequency distributions were then prepared for the quarter landings. The separate quarterly distributions for fish under 5 kg and over 5 kg were pooled to get a total length-frequency distribution for fish landed by the small pelagic fish purse seine fleet. The results showed that the fleet catches a wide range of fish sizes, but largely Pacific bluefin tuna smaller than about 100 cm FL and with most of the catch in the 40-60 cm FL range. This size distribution is similar to that reported for the catch by Korean purse seiners that operate in largely the same are in the East China Sea; however, the distribution does not show significant catches of fish less than 30 cm FL unlike the distribution for the Korean catch.

Discussion:

The WG noted that the midpoint for each weight bin for fish larger than 5 kg was used and the weight range of each bin is broad. Therefore, it was recommended that representative sampling and measuring of fish larger than 5 kg be carried out and the results used instead of the midpoints. The WG also recommended that the results be compared to that of sizes of fish caught by the Japanese troll fishery in the same area of operations.

Pole and line (ISC/07/PBF-1/05)

Presented by Kazuhiro Oshima:

The Japanese pole-and-line fishery targets skipjack and albacore and occasionally catches Pacific bluefin tuna. From 1951 to 1993, sampling of the catch for size-frequency data was spotty and opportunistic. Sampling was largely concentrated in the 1st and 2nd quarters of the year. Since 1994, a regular sampling scheme by RJB was implemented and sampling was concentrated in the 3rd and 4th quarters when most of the catch was landed. Sizes of fish caught by this fishery are largely less than 100 cm FL and concentrated in the 30-80 cm FL range.

For the period before 1991, sizes of Pacific bluefin tuna caught in the 1st and 2nd quarters were similar among the years. Since 1994, data for the 3rd and 4th quarters indicate slightly larger modal size fish caught in the 4th than 3rd quarters. It was suggested that the size samples before 1991 maybe mainly from the catches by the distant water pole-and-line vessels, whereas the size samples after 1994 are from the catches by the offshore and coastal pole-and-line vessels.

Discussion:

The WG noted the significant proportion of large fish, greater than 140 cm FL in this study, as compared to the length frequencies reported by Piner et al. (2006). The WG concluded that, in general, the pole-and-line fishery does not target fish larger than about 100 cm FL and hence, catches of large-sized fish such as 140 cm FL are rare events. The WG also noted that the sample size in which the large fish occurred was small. This may be a bias, but would have insignificant weight in the stock assessment analysis. The working group recommended that length-frequency samples with small sample size be weighted appropriately or not be included for use in the stock assessment model.

Longline (ISC/07/PBF-1/11)

Presented by Momoko Ichinokawa:

Available data on size frequency of Pacific bluefin tuna caught by the Japanese longline fleet were summarized for use in the SS2 stock assessment model. The data are in the form of weight, length or both weight and length measurements and available from four sources with overlapping coverage. All of the data, therefore, were reviewed and selection made to avoid double counting. Weight measurements were converted to FL measurements with a length-weight equation. For weight measurements recorded in longline logbooks since 1994, the resolution appears to be with 5 or 10 kg accuracy, which is low for constructing useful size frequencies. That data source was, therefore, not used in the analysis. After the review, two sources of data, NRIFSF and RJB, were selected for estimating representative quarterly size frequencies of Pacific bluefin tuna caught by the Japanese longline fleet.

The results showed modal progression or apparent growth of strong cohorts. The progression suggested relatively slow growth of the cohorts compared to growth reported in a previous study. The results do not indicate the presence of the strong 2001 year class reported in earlier studies. The size frequencies were pooled into decadal time periods and by fishing area. They show differences, especially the decades before and after the 1971-80 period. In the early decades, catches were mainly of large-sized fish greater than 150 cm FL and insignificant catches of small-sized fish less than 100 cm FL. All of the sizes of fish were caught in all fishing areas, but particularly in the northern area, above northern Honshu. In the recent decades, few large-sized fish and significant catches of small-sized fish are represented in the catch. Also, the southern fishing areas produced all of the large-sized fish and average size decreased from south to north. Further work is planned that will re-examine these size frequency data with respect to the fishing and sampling port, fishing areas and other qualitative information.

Discussion:

The WG discussed the slower apparent growth from modal progression analysis and concluded that factors such as density-dependent growth caused by the strong year class, and possible upper limit of size selectivity by Japanese longliners may be involved in large-sized fish not being fully represented in the size-frequency data.

The WG also discussed possible causes for the differences observed between areas (south vs. north), decades (1970s-1980s vs. other decades), and countries (Japan vs. Chinese-Taipei). It was noted that the geographical distribution of the Japanese longline effort during the 1970s and 1980s changed (ISC/07/PBF-1/17), moved northward, owing to a change in the target species of the fishery. The different pattern of size frequencies during the 1970s and 1980s compared to the other decades, therefore, cannot be attributed simply to inadequate sample size and non-random samplings for those periods. The WG provided suggestions for further research with the data set, including a comparison of catch in number of PBF from logbooks and number of size-frequency samples by fishing area, comparison of Japanese and Chinese Taipei longline fishery size data for the general area where both fleets operate and catch Pacific bluefin tuna, and a study of the migration route to and from the spawning areas, which could explain the latitudinal gradient in the size frequencies.

3.2.2 Chinese Taipei

3.2.2.1 Catch data

Longline (ISC/07/PBF-1/23)
Presented by Chien-Chung Hsu (see section 3.3):

Discussion:

The fishing season and landings of the Chinese Taipei longline fishery were discussed. Hsu explained that the fishing season was short, typically from April to July, with a peak in May and almost no catch observed after July. About 70% of the catch is unloaded in Tunkang where size measurement is taken. The catch is landed dressed and recorded as product weight. This weight is converted into round weight with a conversion factor of 1.16, which was validated. Records on number of fish landed are also available in fishermen association records.

The WG recommended that since catch or landing of fish in number is collected, that unit should be used in tabulating the Chinese Taipei longline fishery data for the stock assessment model. In this regard, the WG suggested that (1) priority should be on collecting catch in numbers; (2) data held by data sources, such as fishermen associations, should be rescued to recover past catches in number. This should be started as soon as possible because only the most recent five years of records are retained by the associations; and (3) because for most of the past catches size-frequency measurements are not available, the next best source for converting catch in weight to catch in number of fish, is the Taiwan yearbook. The size information is average weight of fish caught and determined by fishermen, which unfortunately was not verified.

3.2.2.2 Size data

Longline (ISC/07/PBF-1/24)
Presented by Chien-Chung Hsu:
Pacific bluefin tuna size distributions (fork length in cm) were compiled from data collected by a research program of the National Taiwan University and supported by the National Science Council. Pacific bluefin tuna data were collected since 1992 from port sampling at the main landing port, Tungkang. Each year, over 70% of the total catch landed was measured from late-April to June. The average sample size was 90% of fish unloaded. This high sampling rate was to ensure that the time series of length frequencies was representative of the total catch of Pacific bluefin tuna landed by the Chinese Taipei longline fishery.

MULTIFAN was used to estimate age groups in the length frequencies. The von Bertalanffy growth equation (k=0.1035/year, L_{inf} =320.5 cm FL and t0=0.0728 years) by Yukinawa and Yabuta (1967) was used to obtain starting values for applying MULTIFAN. Estimated age distributions by year (1999-2006) were obtained by summing all of the monthly numbers-at-age estimated from MULTIFAN. Total number of fish caught in each year was calculated by dividing the total weight of fish caught by the individual mean weight (kg) from auction records. The age composition estimates were then used to create a catch-at-age matrix. The results show that the majority of the fish ranged from 186 to 240 cm FL. The major age classes (over 50% catch) was either age 9 or age 10 in any year. The proportion at age 11 and 12+ since 2002 has been increasing and indicate that the catch composition is tending towards older fish in recent years.

Discussion:

The WG discussed the results of the estimated catch-at-age matrix and noted that the Chinese Taipei fishery catches mainly large-sized PBF that are grouped into one mode in a length-frequency distribution. Applying the MULTIFAN model in such a case produces uncertain results. The alternative is to use cohort slicing of the length frequency distribution, but that method has uncertainty as well. The WG concluded that further refining of the data compilation should be undertaken and both the MULTIFAN and cohort slicing techniques be tried. The WG, noted that, ultimately, results of growth studies with hard tissues will be required to determine the accuracy of these two age estimation techniques.

The WG also discussed the trend of larger (older) fish in the catch, but came to no conclusion.

3.2.3 Eastern Pacific Ocean

IATTC (No Document)

Presented by Alexandre Aires-da-Silva:

An oral presentation of the bluefin tuna fisheries in the Eastern Pacific Ocean (EPO) was provided by A. Aires-da-Silva. Pacific bluefin tuna catches in the EPO are predominantly made by U.S. and Mexican purse seiners operating off Baja California, Mexico and California. A lesser amount is taken by recreational fishermen. The U.S. commercial catch has gradually diminished since 1982, shortly after the Mexican EEZ was established. More recently (mid 1990s), the Mexican commercial catch has markedly increased and this catch increasingly used in pen-rearing operations in Mexican waters.

The IATTC has been collecting size-frequency information on Pacific bluefin tuna landed in the EPO. An updated file of Pacific bluefin tuna size frequency data was made available by the IATTC.

Discussion:

The WG discussed the availability and reliability of catch and size composition data for the EPO fisheries. The importance of obtaining reliable catch and size composition data of fish used for pen rearing was emphasized, particularly if size selection, i.e., larger bluefin tuna are targeted for pen rearing, is practiced. It was explained that observers are aboard the purse seiners that catch fish for the pen rearing and their records contain the estimated catches in weight delivered to the holding pens. The estimates are believed to be obtained from the vessel captains. The reliability of these estimates was questioned because they are not verified by an independent direct measurement; however, it was noted that vessel captains' estimates are generally reliable and for past data, this may be the only source of catch data available.

Size frequency data of the recreational catch have been assumed to be representative of the sizes of PBF caught by the purse seine fleets, including catches that are used for pen rearing operations. The commercial and recreational fleets largely fish for PBF in the same geographic area and season, often targeting the same schools of fish. Nonetheless, the WG recommended that the assumption may not be reliable and that size composition sampling is required for all fisheries, including the purse seine fisheries especially because the EPO fisheries currently land a significant share (~50%) of the total PBF catch.

A. Aires-da-Silva also informed the WG of the IATTC efforts to estimate the tonnage and size composition of fish entering the pens. He described recent cooperation from pen operators to obtain direct, and what the operators consider very confidential, information about the operations. Information being sought includes actual sizes of fish placed into the pens, and sizes of fish and total tonnage when fish are removed from the pens. This will allow the IATTC to evaluate biases (if any) associated with using size data collected from recreational fishermen to represent sizes of fish placed in the pens and to evaluate catch estimates recorded by observers.

3.3 Review of available CPUE series

Qualitative analysis on historical change of Japanese longline fisheries for Pacific bluefin tuna by K. Oshima (ISC PBF-WG/07-1/#17)

Standardized CPUE of Pacific bluefin tuna estimated by the previous studies showed a drastic decline in the early of 1960s and leveled off thereafter. Qualitative analyses on the historical change of Japanese longline fisheries for Pacific bluefin tuna and reviews of the reliability of the standardized CPUE presented in previous studies were conducted. Analysis of catch and effort by area and by year resulted in a shift from Areas 2 and 4 as the main fishing ground for PBF to Areas 1 and 3; there were obvious differences in species compositions of catch between Areas 1 and 3 and Areas 2 and 4, respectively. Results of analysis on the catch and effort data by HPB class, by area and by year are shown clearly as follows: 1) CPUE by the shallower sets of HPB 3-4 and 5-6, which were the main gear configuration in the early of 1960s, increased to the highest level in the study period and subsequently decreased steeply; 2) the shallower sets operated mainly in Areas 2 and 4 caught tuna species mainly; 3) A large portion of their positions of fishing operation shifted to Areas 1 and 3, changing the target to sharks, marlins and swordfish; 4) the deepest sets of HPB 13-22, which were started in the large scale since 1980s, was main gear configuration to harvest tuna species in the recent years. It was proposed that the method to standardize CPUE of PBF caught by Japanese offshore and distant water longliners should be re-examined before it is used for the stock assessment and detailed check of data also should be done for this purpose.

Discussion:

It was recommended not to use the single historical CPUE used in the previous assessment because of the shift of targeting and changing of operational modes. Logbook data sets by Japanese offshore and distant-water longliners are discontinuous with respect to the coverage of area, gear configuration, target-species and set in day or night. The WG discussed what strata of the data could give enough consistency to produce a reliable abundance index for PBF. It was pointed out that there were some difficulties in selecting appropriate strata with consistent data through the long time periods because no information was available on the historical shift of longline set in day or night, and targeting albacore even though the shift could be roughly observed from the historical species composition by area. It was also pointed out that the data in area 1 (north part of fishing ground) of HPB (Hooks per Basket) 3-4 and 5-6 seemed to have relatively consistent data regarding to the species composition. In addition, data in area 4 (southern area of fishing ground) of HPB 7-12 and 13-22 should also be explored. The percentages of the data presented in the document were also questioned. Coverage of the data in quarter 2 and the selected area was high during the 1960s, but not so high after the period because fishing efforts moved north to target species other than PBF. The WG requested that consistent data sets be extracted from the available Japanese logbook data (not only from quarter 2) for the present, and that CPUE be made with the consistent data even if it will be segmented by area, time periods, or otherwise.

Re-examination of the bluefin tuna CPUE index derived from commercial passenger fishing vessel logbooks 1995-2006 by K. Piner (ISC/07/PBF-1/26)

An index of juvenile bluefin abundance from waters off Southern California (USA) and Baja California (Mexico) was created from the for-hire recreational fleet logbooks (ISC PBF-WG/07-1/#26). The index spans 1995-2006 and was created using a delta-GLM approach. The index improves upon an earlier version as it eliminates groundfish trips through the use of individual trip data. This analysis also eliminates reporting rate changes by constraining the analysis to the years of consistent logbook structure. However due to the spatial location of the fishery, the confounding effects of abundance and availability (movement) relating to a single NPO stock remains.

Discussion:

Similar trends will be observed in the estimated CPUEs from two sources, recreational fleet data in the EPO and Japanese troll data, probably because recruitments in the 3rd and 4th quarter in the western Pacific Ocean move to the EPO within the same fishing year. This speculation comes up in some tagging studies using archival and conventional tags (Inagake et al. 2001, Bayliff et al. 1991). Therefore, incorporation of size data and this CPUE series will be important. Further investigation would also be needed, such as comparison with the CPUE presented from Simon in the previous assessment. The WG also recommended investigating the effect of interaction by season and area. Determinations will be made on which data, aggregated or individual fishing trip data, would be better to use in the future. Because the variance of the estimated CPUE is large, it may not affect the result of the stock assessment even if the index is used.

Standardized CPUE of north Pacific bluefin tuna caught by Japanese coastal longliners by M. Ichinokawa (ISC/07/PBF-1/16)

Results of standardized CPUE of Pacific bluefin tuna caught by Japanese coastal longliners as an abundance index for the use in stock assessments were presented. CPUE of Pacific bluefin tuna was standardized using selected longline operations conducted in the main spawning season and area. A delta-type two-step model was applied for the standardization of CPUE. In order to incorporate possible difference in catchability between vessels targeting and not targeting Pacific bluefin tuna, three types of effects were tried in addition to traditionally used effects, such as month and number of hooks per basket in the analysis. The explanatory variables were ship name as random effect, magnitude of longline cruise as a fixed effect, and 'target' effect, defined as the ratio of PBF to the total catch of bigeye tuna of ships. The selected explanatory variables were different between the 1st and 2nd step. Diagnostic distribution of the residuals was skewed especially in the model of 2nd step because of too small a catch for each operation. Random effect of ship name improved the over-dispersion condition of the binomial model in the 1st step, but not statistically significantly in the 2nd step. The duration of longline cruises affected the model slightly-- the catchability of small vessels with short cruises was relatively high. The estimated annual trends of standardized CPUE were constant or fluctuated slightly during 1994-1998, followed by gradual decreases from 1999 to 2001, then increased by 2005, and decreased in 2006. Because the 2006 database was only preliminary (2/3 of the total possible data), the large drop of CPUE from 2005 to 2006 should be investigated as soon as new data for 2006 become available. Trends in the CPUE estimates for the northeastern region of the Pacific bluefin tuna fishing ground were similar to trends in CPUE for the southwestern region, and for Chinese Taipei longliners reported by Lee and Hsu (2006). These three trends might represent abundance trends of Pacific bluefin tuna of different age classes because the sizes of fish caught the fisheries are different. Careful investigation of possible relationships among area, size frequencies and CPUE should be undertaken in future studies.

*Discussion***:**

It was pointed out that ship names recorded in the Japanese logbooks might not be consistent throughout a time series because the interpretation of Japanese characters are difficult, and ship names can be easily changed by fishing masters. The WG also noted that two extreme modal distributions of residuals in the 2nd step could be due to the tendency of fishermen to return to ports quickly after catching PBF, resulting in non-random sampling. In addition, it was also suggested that the density of PBF might be too low for number of hooks to be representative of effective effort. Although annual trends of CPUE estimated from positive catch data in the 2nd step did not contribute to appreciable annual trends of CPUE, potential uncertainty of this result could not be properly evaluated and improvements in the model made..

The WG also discussed the possible increased targeting of bigeye tuna might have been the basis for the apparent expansion of fishing ground for PBF in the region of 30-35°N and 140-160°E. The WG noted that the age classes represented by the CPUE indices should be investigated with length frequency data. The WG recommended that the study be repeated with catch per set for CPUE as well as applied with data of offshore and distant water longliners. If the diagnostics of this analysis indicate that this index is better than the earlier CPUE index, it should be considered for use in the assessment. .

Taiwanese longline CPUE presented by Chien-Chung Hsu (ISC/07/PBF-1/25)

An abundance index for the small longline fishery targeting mainly spawners of Pacific bluefin tuna in the Southwestern North Pacific was presented. Fishing effort was defined as hooks lifted daily, which were estimated from vessels' fishing days and average hooks deployed per day, about 1,400 hooks. Only vessels operating at, and near, fishing grounds in May and June were included in the analysis because longline vessels generally were not targeting Pacific bluefin tuna. Those that targeted Pacific bluefin tuna stayed longer at sea to search for fish and during the beginning and the end of the fishing season. Thus, factors considered in the analysis were: Year (1999-2006), Month (May and June), Size of vessel (three categories: 10-20 GRT, 20-50 GRT and 50-100 GRT), Effort (number of hooks) and Catch in number. Factors considered for GLM were fishing year, month, size of vessel, and two-way interaction between month and size of vessel. Linear combination with expected logarithm catch per unit effort (lnCPUE) assuming a Gaussian error distribution was used. The full model used for GLM is: $\ln(CPUEijk+constant) = \mu + Yi + Mj + Sk + Mj*Sk + \varepsilon ijk$. A step-wise regression procedure was used to determine the set of systematic factors and interactions that significantly explained the observed CPUE variability; Chi-square distribution was used to test significance of an additional factor in the model and the number of additional parameters associated with the added factor minus one corresponds to the number of degree of freedom in the test; Deviance analysis tables present the difference of deviance between two consecutive models. Because factor combinations had unequal numbers of observations, the final selection of explanatory factors was conditional on the significance of the Chi square test and the type III test of significance within the final specified model. Relative index was calculated as the year effect least square means (LSMeans) for GLM. The nominal catch-per-unit-effort depicted a sharp declining trend from 1999 to 2002, slightly increased in 2003 and 2004, and then fell down to the lowest value in 2005 and 2006. To validate the error assumption, the frequency distribution of residuals and the quantile-quantile (Q-Q) plot of residuals were examined; The distribution of residuals illustrates a normal distribution with zero mean and one standard deviation, and Q-Q plot demonstrates that most of residuals rely on 45° line. Also normality of residuals were tested by the Kolmogorov-Smirnov indicating that distribution of residuals was normal (D=0.0355, <0.01). The annual abundance index sharply declined from the highest in 1999 to the lowest in 2002, restored and stayed steady in 2003 and 2004, and dropped down to the low level in 2005 and 2006.

*Discussion***:**

The study assumed nominal effort to be constant number of hooks (700 hooks, 2 sets per day) which were similar by vessel per fishing days. Recognizing possible variation in the number of hooks and other potential variations by set, supplementing the current data to include information about detailed fishing area and number of hooks was recommended. Interaction factors in relation to year factor may be used to compare the results obtained in this study. Because Chinese Taipei vessels catch larger fish than Japanese vessels, CPUE calculated using Japanese longline logbook data might not be representative for the entire spawning population of PBF.

The WG noted that the Chinese Taipei longline CPUE might represent abundance of older individuals not available to other longline fleets. If so, the CPUE is an important index that should be investigated further, particularly in collaboration with Japanese scientists and incorporating data from Japanese longliners.

Update standardized CPUE of age-0 Pacific bluefin tuna by Japanese troll fishery by H. Yamada, (ISC/07/PBF-1/20)

For the purpose of monitoring the recent recruitments, the standardized CPUE derived from Japanese troll fishery operating in the East China Sea and the Sea of Japan was updated for 1980 – 2006 by the addition of a year of data. The GLM model was applied to each areas data for standardizing the CPUE. Large fluctuations in the yearly changes of CPUE were observed in both fishing areas. Higher CPUE in 1994 are observed in the both series, although there is no consistency in both CPUE trends after 1995, with the trends showing a mirror reflection 1997 – 2001. This reason for some of the discrepancy may be due to oceanographic conditions affecting juvenile transportation to the East China Sea and the Pacific Ocean. It is possible that the CPUE in the East China Sea are affected by recruitment produced in the Sea of Japan, as well as in the Pacific Ocean. It is pointed out that the larger and continuous spatial scale studies are conducted in the trolling fishing grounds along the Japanese coast of Kyushu, Shikoku and west of Honshu.

Discussion:

The problem of inconsistency in the treatment in the study of data from vessels not unloading their catch after each trip between Nagasaki and Kochi data sets was noted. The number of the vessels involved is very few in the Nagasaki data set, but relatively high in Kochi data set. An approach to create a long time series of CPUE estimated with the Nagasaki data set only was discussed because CPUE for Nagasaki data was estimated from different data sources in different periods. The WG agreed that one CPUE series using data from only 3 areas off Nagasaki should be developed for use in the stock assessment model.

The treatment of two different CPUE series derived from different prefectures of Nagasaki and Kochi was also discussed. There are two hypotheses explaining the discrepancy between the CPUEs derived from the two regions, 1) potential random variability of CPUEs, or 2) different trends in recruitments with different birth days (or different birth places). A test of the two hypotheses is needed in future studies through analyzing size, effort, and catch data. In addition, stock assessment models corresponding to the two hypotheses (single quarter recruitment and use simple average as used in the previous analysis or two CPUEs, and recruitments in 2quarters adjusted by the two different CPUEs respectively) may be needed. Nevertheless, the two CPUE series from

Nagasaki and Kochi will be used in the stock assessment after appropriate modification. Appropriate modification might include separation of the troll fishery into the data from Pacific side and Sea of Japan.

Temporal distribution of the data within a single quarter will be checked in order to investigate the effect of potential bias resulting from growth within a single quarter on the standardization of CPUE. Availability of the data by number will also be investigated in the future. It is also recommended that more detailed description and review of the data and method used in this analysis will be presented in the next document.

4.0 REVIEW OF DEFAULT BIOLOGICAL INFORMATION

4.1 Biological Parameters Used for the Pacific Bluefin Tuna Stock Assessment in the ISC PBF WG (ISC/07/PBF-1/13).
Presented by Harumi Yamada.

Available biological parameters of PBF:

Stock structure: single stock was assumed
Growth curve: Yukinawa and Yabuta (1967) $Lt=320.5(1-e^{-0.135t-0.07828})$
Maturity: Bayliff (1994), Yorita (1981) and Ishihara (1994)
Length-weight relationship:
Shingu et al. (1974) $GG(kg) = 0.2977 \times 10^{-4} FL(cm)^{2.9103}$
Watanabe et al. (2006) $GG(kg) = 0.13 \times 10^{-4} FL(cm)^{3.06}$ for Qt1
$GG(kg) = 0.10 \times 10^{-4} FL(cm)^{3.11}$ for Qt2
$GG(kg) = 0.13 \times 10^{-4} FL(cm)^{3.06}$ for Qt3
$GG(kg) = 0.25 \times 10^{-4} FL(cm)^{2.92}$ for Qt4
Conversion factor of Gilled and Gutted weight to round weight:
1.15 was applied as same as the value of Atlantic bluefin tuna.
Natural mortality: Bayliff et al (1991), Takeuchi and Takahashi (2002) and Tanaka (2006)

Weight at age, maturity at age and natural mortality at age was as follows.

Age	0	1	2	3	4	5	6	7	8	9	10+
Wt(kg)	1.0	5.7	15.5	25.6	42.2	62.2	84.9	109.6	135.7	162.5	218.0
Mat	0.0	0.0	0.0	0.2	0.5	1.0	1.0	1.0	1.0	1.0	1.0
M	1.6	0.8	0.4	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Discussion:

The spawning ground of PBF is distributed in the waters of the Pacific between northern Philippine and southern Japan and also in the Sea of Japan. There is no evidence for the presence of sub-populations in the PBF stock, however, it was noted that there were differences in fish size (age) and spawning season between the two spawning grounds. The difference in the maturity-at-age between Pacific and Sea of Japan was discussed (i.e. minimum maturity age was at age 3 in the Sea of Japan vs age 5 in the Pacific). Accumulating all biological parameters to be used for the next stock assessment of PBF was discussed.

4.2 Age determination and growth

Presented by Toshiyuki Tanabe:

The activities on age and growth study of Pacific bluefin tuna using otoliths collected in 2004 and 2006 were reported. The manual of age determination of southern bluefin tuna reported by CCSBT was referred to for the age determination of PBF. The age of 158 individuals of 97-280 cm in fork length (FL) ranged from 2 to 22. The age-length plots between the ages of 5 and 13 (around 125 and 235 cm FL, respectively) corresponded to the growth curve reported by Yukinawa and Yabuta (1967). The data from large fish older than age 15 was limited. Further studies on the age and growth of bluefin tuna at lengths larger than 250 cm FL are necessary, especially to verify the growth of the largest size of fish.

Discussion:

The WG agreed that to make a progress, a sampling program targeting on large tuna was strengthened in 2007. The importance of obtaining the precise growth curve in the stock assessment was reiterated.

4.3 Natural mortality

Presented by Yukio Takeuchi:

The natural mortality rates (M) for PBF used in the previous stock assessment and new estimates based on Jensen (1996) and Chen and Watanabe (1989) were reviewed. The former values were estimated by Bayliff et al (1991) based on the equation by Pauly (1980), and M at age 3 and older was fixed at 0.25 The latter values were recalculated using the the growth curves of Bayliff et al. (1991), Yukinawa and Yabuta (1967) and Piner et al. (2006). The results indicated that the values used at the last assessment are at the high end of the ranges of the estimated values.

Discussion:

For the next stock assessment, it was agreed to use lower values of M in addition to those used in the most recent assessment.

4.4 Maturity size (ISC/07/PBF-1/27)

Presented by Sho Tanaka:

The size at maturity of PBF based on the histological examination of females was analyzed. A total of 1711 fish smaller than 150 cm FL were collected in the Sea of Japan during 1994 and 2006. The minimum length at maturity by year ranged from 99 to 130 cm FL (due to the small number of specimens, data for 1995-1997 and 2000-2001 were not included).

Discussion :

Maturity-at-age in the area of the Pacific where the main spawning ground is located was not examined due to the difficulty in obtaining gonad sample from fish less than 150 cm. Enhanced sampling of gonad samples is recommended. In the Sea of Japan, catches of mature fish are mostly made by purse seine, it was recommended future studies take sufficient number of samples from different sets, as the maturation could take place school by school.

5.0 RE-EXAMINATION OF STOCK ASSESSMENT MODEL INPUT DATA

5.1 Advances in analytical population modeling of Pacific bluefin tuna since ISC-PBF-2006 presented by Y. Takeuchi (ISC07/PBF01/18)

Advances in the analytical stock assessment model made since the last stock assessment were reviewed. Further sensitivity analyses of Piner et al (2006) were conducted. Among them stock biomass (both total and spawning stock) and recruitment in early time period were found to be very sensitive to the assumption of the initial equilibrium catch while they are robust in recent years.

Discussion

The WG primarily focused its discussion on the initial SS2 model structure to be used for the 2008 PBF stock assessment. Full discussion of model structure needs to await the completion of the final assessment database – including progress on some of the studies recommended in the *Catch*, *Size Frequency*, and *CPUE* sections, above. However, the WG agreed to a preliminary model structure characterized by the following recommendations (in italics):

1) There are three possibilities for estimating the initial PBF population age structure in the starting year of the assessment time series (e.g. 1952 or some later year):
    a) estimate the numbers at age in the starting year as model parameters;
    b) assume the population was in equilibrium prior to the starting year with some constant catch, and estimate recruitment deviations for some number of years prior to the starting year; and
    c) assume the population was in a virgin state prior to the starting year, and estimate virgin biomass (B_0) and the associated recruitment (R_0).

    Option a) is the preferred option.

2) The number of fisheries should be greatly reduced from the 33 fisheries used in the 2006 SS2 modeling. *The initial structure for the 2008 assessment should include only the 9 fisheries suggested in WP 18.*

3) When using SS2 v2, recruitment can be set to occur at the beginning of one or more quarters. This differs from older versions of SS2 where recruitment could only occur at the beginning of the year. *Recruitment should be set to occur at the beginning of the third quarter (July 1)*. It was noted, however, that should any

difficulties arise in using this new SS2 option, the use of a "fishing year" beginning on July 1 could be an alternative approach.

4) *The SS2 option to estimate PBF growth rate(s) should be explored* (perhaps by fixing the length at maximum age and estimating K and the length for the first age). This model structure will allow incorporation of the otolith data (ISC/07/PBF-1/14); and perhaps if warranted, the use of time period specific growth rates.

5) *Asymptotic selectivity for the Chinese-Taipei's and Japanese longline fisheries should be used as the default*. Depending on the outcome of ongoing work, however, it may be desirable to split the Japanese fishery into two fisheries: one from Area J5 with asymptotic selectivity and another covering Areas J1-J4 with dome-shaped selectivity.

6) *As a default, the starting year for the assessment time series should be 1952*. However, a number of concerns were raised regarding the early period of such a time series that require further consideration and perhaps a later starting year:
   a) size frequency data are sparse and may not support the estimation of the initial age structure in 1952 (as suggested in Recommendation 1, above);
   b) there may be bias in the Japanese tuna purse seine size samples in the early years due to exclusion of small fish in the sampling (this requires further investigation); and
   c) There may be qualitative differences in the reliability of the data prior to 1965 when the effort to computerize the logbook data began.

7) *As a default, the maturity ogive used in the 2006 stock assessment (see WP 13) should continue to be used*. However, based on new maturity data from the Sea of Japan (WP 27), the sensitivity of results to greater proportion mature at age 3 should be explored.

8) *The instantaneous rate of natural mortality (M) for sub-adult and adult ages should be in the range suggested in WP 15(e.g. 0.1-0.25)*. As is typical with many assessments, however, sensitivity analysis on M may be appropriate.

9) *Length-weight relationship(s) based on round weight should be used* (the 2006 assessment used processed weights). Further, the need for seasonal length-weight relationships needs to be investigated. If deemed necessary, some modelling difficulties may arise because SS2 does not currently support season-specific length-weight. Fisheries for which catch in number is available are unaffected; but for those fisheries with only catch in weight, some workaround may be needed.

10) *More realistic sample sizes associated with the size frequency data should be developed.* This should lessen the need for model-based iterative re-weighting to reduce the difference between observed and effective sample sizes.

11) *If possible, MCMC should be used to characterize the precision of the estimates from the base case model; and if a single base case is not achievable, model averaging should be explored.*

For the 2006 assessment, both SS2 and ADAPT VPA were used. However, due to the large amount of work needed to prepare for the 2008 assessment, it may not be possible to carry out the developmental work needed to employ both modeling platforms. If so, the ADAPT VPA work is considered to be a lower priority. If time permits, catch at age matrix should be created as a diagnostics tool.

Finally, it was recognized that the greater complexity of the SS2 modeling and much longer run times – compared with VPA or other simpler models – make it very difficult to carry out the model-building process and fully explore diagnostics and other issues during the course of a one-week working group meeting. As such, it will be necessary to conduct preliminary runs and carry out sensitivity analysis prior to the PBF WG meeting at which the 2008 assessment is to be completed. In order to structure the next assessment along these lines, it will be necessary for the final stock assessment database (i.e. all data needed for SS2 input files) to available to all WG participants no later than December 2007. The most efficient means of achieving this goal will be to schedule an ISC PBF WG data preparation meeting in December 2007. This meeting will provide an opportunity for all WG participants to review and make final modifications to the database; further discuss SS2 model structure and the sensitivity runs needed; and leave the meeting with the final database in hand.

6.0 WORK ASSIGNMENT FOR THE MEETING IN JULY

The WG discussed the tasks that need to be completed before the July WG meeting to be held in Pusan, South Korea. Two important objectives of that meeting are to characterize both the size of the 2001 year-class and the recent trend in stock abundance. Addressing both questions should provide information about the reliability of previous stock assessments and provide guidance for the next stock assessment to be completed in 2008.

The first question is important because the 2001 year-class was estimated to be significant in the last stock assessment. The WG recommended that the National Research Institute of Far Seas Fisheries collate information regarding the size of the 2001 year-class from the working papers presented at this meeting. Especially relevant will be papers presenting CPUE analyses or length composition series that may contain signals regarding the strength of that recruitment. The WG also requested that the IATTC staff collate information from EPO data for the same purpose.

The second question of recent stock trends will be handled in a similar manner. Recent trends in the CPUE, size composition and catch will be used to qualitatively characterize recent changes in stock abundance and fisheries practices. The WG recommended that the Chairman of the ISC and the Statistic WG contact South Korea to request their catch data. In addition, National Research Institute of Far Seas Fisheries staff will investigate statistical document program as a means to estimate Korean catch.

The WG agreed the necessity of further specification of SS2 modeling for next stock assessment in the meeting in July 2007.

The WG should review the progress of the work assignments of category 1 listed in section 9.

7.0 RECOMMENDATIONS AND IDENTIFICATION OF THE TASKS TO BE COMPLETED BEFORE THE NEXT STOCK ASSESSMENT

The PBFWG is planning to complete a full stock assessment in 2008. Preparation for that assessment is underway. This workshop is the first in the series and dealt largely with data preparation and analytical procedures for developing the time series of fishery and biological data required for the assessment. The Group also discussed decision criteria for selection of parameter estimates and the preferred stock assessment model to be used. Further discussion on these latter topics will occur through email as well as at future workshops. The following is a summary of recommendations for data improvements and check lists of tasks that need to be completed by the next PBFWG Workshop in July 2007 and other Workshops leading up to the full stock assessment in 2008.

The recommendations and tasks listed below are categorized into three; 1) must be finished before the meeting in July 2007,2) must finish before the next stock assessment, 3) continue in the future

7.1 Historical fisheries data

<u>Category 1 by July meeting</u>

Japanese small pelagic purse seine (H. Yamada)

- ✓ Evaluate the possible underestimation of average weight of the box in which catches is held at the landing sites. This probably resulted in the underestimation of catch weight

<u>Category 2 For next assessment</u>

Japanese longline

On quarterly catch (Oshima)

- ✓ Estimate quarterly catch in weight by coastal longline
- ✓ Decision of using either catch in number or catch in weight.
- ✓ Investigate operational pattern of coastal LL before 1994.
- ✓ Conduct sensitivity analyses using catch in weight of Japanese offshore longline from SID report

On size data (Ichinokawa)

- ✓ Investigate the reason of historical change of size distribution and the possibility of area stratification

- ✓ Compare catch number of PBF from logbook data and sample number of size data, by area

Japanese troll

On catch (Yamada)

- ✓ Clearly document what type of catch information was utilized to estimate quarterly estimation form 1981-1993
- ✓ Decide which quarterly average catch proportion (1981-1993 or 1981-2006) should be applied to quarterly catch estimation before 1980
- ✓ Conduct sensitivity analyses in stock assessment using quarterly catch estimate with above mentioned different assumptions

Japanese small pelagic purse seine

On size (Yamada)

- ✓ Start collecting the size data from the fish larger than 5kg

Japanese tuna purse seine

On catch (Takeuchi)

- ✓ Extend estimate till latest quarter (2007Q3?)
- ✓ Try validation of definition of size category

  -Use size data after 1994(RJB). Compare SID and RJB

  -Collect information regarding the definition used for size category in market so that we can explore the difference of amount of catch by size category between market record collected by fisherman's association and SID

On size data

- ✓ Establish and improve three hypotheses for modeling the selectivity of this fishery for stock assessment
  - ✧ Selectivity has changed from large fish to small fish.
  - ✧ Selectivity was constant so that do not use size data prior to 1994 or 1986 or 1974
  - ✧ Selectivity is constant and size sampling is OK but age or size structure of population changed
- ✓ Estimate appropriate effective sample size based on number of set in the logbook or other data source (in recent year (1994-) information of number of days spent for size sampling is available)

Japanese pole-and-line

On catch

- ✓ Use logbook data aggregated into 1x1 by 10days for data before 1971, in order to estimate quarterly catch instead of using average quarterly proportion (Oshima)
- ✓ Verify PBF catch in the logbook in East China Sea (doc 4) to investigate the reason of discrepancy between catch estimates by logbook and SID report. (Uosaki)
- ✓ Investigate fishing season by vessel category (Oshima)
- ✓ Try to separate coastal pole and line catch and offshore and distant water pole and line catch. (Oshima)

Size data (Oshima)

- ✓ The size data before and after 1994 is separated as data derived from different fishery.

- ✓ Check on the difference in the length frequency among fishery category of PL.
- ✓ Check on representativeness of size data. Especially, the size database in Qt. 3 and Qt.4 before 1994 is examined carefully, because the data derived mainly from the catch by the distant water PL.

Chinese-Taipei's longline (Hsu)

Catch

- ✓ Catch in number should be used instead of catch in weight for stock assessment.

<u>Category 3</u>

General recommendation on catch and size data

- ✓ Estimate the magnitude of uncertainty of catch estimate with respect to the definition of size category (Maguro and Meji) for stock assessment purposes
- ✓ Size data should be weighted by catch (Japanese troll, Japanese LL, etc)
- ✓ Investigate possible signal of recruitment from spawning ground in the Sea of Japan from size data (Japanese troll, set net, small pelagic purse seine)

Japanese coastal longline

- ✓ Compare size data between Japan and Chinese-Taipei.
- ✓ Investigate the location where the sampling and/or fishing was done
- ✓ Document the relationship between strong year classes and growth rate of fish to clarify the reason of apparent slow growth of strong cohorts observed in the size data: because of biological factor, selectivity of fisheries, or others?

Japanese tuna purse seine

- ✓ Relate logbook database and size data to estimate location of fishing through the interview to fishermen and industry people.

EPO: (Alex , Dreyfes)

- ✓ A temporal shift of the catch from younger fish to older fish was noted from papers presented at previous meetings. Future research should include an investigation of possible changes in size selectivity.
- ✓ The validity of the skipper estimates of total catch of fish entering pens should be investigated.

Data collection: (Alex , Dreyfes)

- ✓ Improve the estimates of the tonnage and size compositions of the fish entering the pens in the Mexican farming operations.
- ✓ Continue IATTC's current efforts for data improvements in coordination with other member countries of ISC.
- ✓ Report results of the ongoing research efforts in the future meetings of the WG.

- ✓ Investigate the validity of the assumption of same size selectivity between sport and commercial fisheries.

Chinese-Taipei's longline

- ✓ Supplement additional information on hooks and location of fishing for individual set
- ✓ Estimate catch prior to 1965, if possible

7.2 CPUE

<u>Category 2; Before next stock assessment</u>

Japanese offshore longline (Oshima)

- ✓ Develop new CPUE time series for different time frames (perhaps more than one)

Japanese Coastal longline (Ichinokawa)

- ✓ Update CPUE with complete 2006 data

Chinese-Taipei's longline (Hsu)

- ✓ Compare with Japanese longline CPUE in J5 with collaboration to Japan

U.S. recreational fleet (Piner)

- ✓ Evaluate month*area effect

Japanese troll (Yamada)

- ✓ Build single time series for Nagasaki
- ✓ Use separate time series for Kochi(1993-2006) and Nagasaki(1980-2006)

EPO purse seine (Alex)

- ✓ Update CPUE in 2006

7.3 Biological data

<u>Category 1; For next July meeting; nothing but if possible</u>

- ✓ Summarize the previously reported conversion factors and length weight relationship (Kai)

<u>Category 2;For next stock assessment</u>

- ✓ Conduct sensitivity analysis on Natural Mortality (Takeuchi etc)
- ✓ Collect biological samples (mainly otoliths from large fish) as much as possible, and report the results (Tanabe)
- ✓ Report the results of analysis of gonad samples collected in the Pacific side.(Tanaka)
- ✓ If possible, report on the description and the method to discriminate the catch & size data of recruitment occurred in the Japan Sea and the Pacific (Ichinokawa)

Category 3; for near future

- ✓ Establish good sampling network for otolith sampling and obtain large number of otolith for better information on age and growth

7.4 Stock assessment model

The WG noted that during the last WG meeting in Jan 2006 and subsequent plenary meeting, several problems were identified. Several working papers presented in this meeting will affect and contribute to resolve these problems. However the group also recognized that it will not finish before next stock assessment in 2008. The group finally decided that Stock Synthesis II will be used for stock assessment and that ADPAT VPA will be unlikely used in the next stock assessment. This does not mean that ADAPT VPA or any other stock assessment model will not be used in future assessment after 2008.

Specifically to the Stock Synthesis II model application, working group decided following (also see section 7)

- Estimate initial age structure (estimate recruitment deviation before 1952, with no equilibrium catch assumptions) or the two other ways listed in section 7
- 9 fisheries
    - Japanese longline (may be separated into coastal and offshore or north and south)
    - Japanese small pelagic purse seine
    - Japanese tuna purse seine
    - Japanese troll
    - Japanese pole and line
    - Japanese set net
    - Others (include Japanese drift net, handline and Chinese-Taipei's fisheries other than longline etc)
    - EPO (include commercial and recreational fisheries)
    - Chinese-Taipei's longline
- Fishing year or calendar year with recruitment in Q3
- Try to estimate growth curve
- Try dome shape in JLL (default =flat top)
- Try separation of JLL into north and south
- 1952 (as default) or somewhat later
- Maturity (continue to use age 3(20%)?)
- Consider lower M (=0.25) for sub adult than used in previous assessments
- L-W relationship, SS2 can not have seasonal L-W

8.0 OTHER MATTERS

The next meeting is scheduled in July 19-21 (before plenary meeting) in Busan.

The WG discussed to complete the next stock assessment before the plenary in 2008. With this objective the stock assessment meeting should be held approximately in May 2008. In this case the WG will need another meeting for discussion on data and model configuration possibly in December 2007.

9.0 ADJOURNMENT

The draft report was developed. An edited version of the report will be available as soon as possible. The WG agreed that Yukio Takeuchi will be available to summarize at upcoming other meetings. The Chair thanked all participants and the rapporteurs for their contribution in making this a successful meeting. The participants expressed their thanks to NRIFSF for hosting the meeting. The meeting was adjourned at 16:45 on 23 April 2007.

References

Bayliff, W.H., Y. Ishizuka and R. B. Deriso. 1991, Growth, movement and attrition of northern bluefin tuna , Thunnus thynnus, in the Pacific Ocean, as determined by tagging. IATTC, Bull., **20**: 1-94

Inagake, D., H. Yamada, K. Segawa, M. Okazaki, A. Nitta and T. Ito 2001, Migration of Young Bluefin Tuna, *Thunnus orientalis* Temminek et Schlegel, through Archival Tagging Experiments and Its Relation with Oceanographic Conditions in the Western North Pacific, Bulletin of the National Research Institute of Far Seas Fisheries, **38**: 53-81

Appendix 1
List of the Participants

Chinese-Taipei

Chien-Chung Hsu
Institute of Oceanography, National Taiwan University
1, Section 4, Roosevelt Road, Taipei, Taiwan, 106
886-2-33661393, 886-2-23661198 (fax)
hsucc@ntu.edu.tw

Japan

Fumihito Muto
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6035, 81-54-335-9642 (fax)
mtf@fra.affrc.go.jp

Hitoshi Honda
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6042, 81-54-335-9642 (fax)
hhonda@affrc.go.jp

Harumi Yamada
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6034, 81-54-335-9642 (fax)
hyamada@fra.affrc.go.jp

Kazuhiro Oshima
Japan NUS Co., ltd
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6034, 81-54-335-9642 (fax)
oshimaka@fra.affrc.go.jp

Kotaro Yokawa
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6035, 81-54-335-9642 (fax)
yokawa@fra.affrc.go.jp

Kyuji Watanabe
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6033, 81-54-335-9642 (fax)
watanabk@fra.affrc.go.jp

Masahiro Abe
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6039, 81-54-335-9642 (fax)

Mikihiko Kai
Japan NUS Co., ltd
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6035, 81-54-335-9642 (fax)
kaim@fra.affrc.go.jp

Momoko Ichinokawa
Visiting scientist to NOAA/NMSF PIFSC
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6039, 81-54-335-9642 (fax)
ichimomo@fra.affrc.go.jp

Naozumi Miyabe
National Research Institute of Far Seas Fisheries
5-7-1, Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6037, 81-54-335-9642 (fax)
miyabe@fra.affrc.go.jp

Toshiyuki Tanabe

National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6045, 81-54-335-9642 (fax)
katsuwo@fra.affrc.go.jp

Sho Tanaka
School of Marine Science & Technology
Tokai University
3-20-1 Orido, Shimizu, Shizuoka, Japan 424-8610
81-54-337-0930, 81-54-334-5905
sho@scc.u-tokai.ac.jp

Tomoyuki Itou
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6033, 81-54-335-9642 (fax)
itou@fra.affrc.go.jp

Yukio Takeuchi
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-6039, 81-54-335-9642 (fax)
yukiot@fra.affrc.go.jp

Ziro Suzuki
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka, Japan, 424-8633
81-54-336-60 , 81-54-335-9642 (fax)
zsuzuki@fra.affrc.go.jp

United States

Kevin Piner
NOAA/NMFS SWFSC
8604 La Jolla Shores Dr.
La Jolla, CA 92037 U.S.A.
1-858-546-5613, 858-546-7003 (fax)
Kevin.Piner@noaa.gov

Gary Sakagawa
NOAA/NMFS SWFSC
8604 La Jolla Shores Dr.
La Jolla, CA 92037 U.S.A.
1-858-546-7177
Gary.Sakagawa@noaa.gov

Ray Conser
NOAA Fisheries
Southwest Fisheries Science Center
8604 La Jolla Shores Drive
La Jolla, CA 92037
United States
ray.conser@noaa.gov

IATTC

Arexandre Aires-da-Silva
Inter-American Tropical Tuna Commission
8604 La Jolla Shores Drive
La Jolla, CA 92307-1508 U.S.A.
1-858-546-7022 , 858-546-7133 (fax)
alexdasilva@iattc.org

Appendix 2

List of Documents

ISC/07/PBF-1/01	Reviews of Japanese fisheries and catch statistics on the Pacific bluefin tuna (H. Yamada, hyamada@fra.affrc.go.jp)
ISC/07/PBF-1/02	Estimation of the quarterly catches of PBF by Japanese troll fisheries in 1952 – 2006 (H. Yamada, hyamada@fra.affrc.go.jp)
ISC/07/PBF-1/03	Length frequency of sampled data in the Pacific bluefin tuna caught by Japanese Troll (M. Kai, kaim@fra.affrc.go.jp and M. Ichinokawa)
ISC/07/PBF-1/04	Estimation of quarterly catch of Pacific bluefin tuna caught by Japanese pole-and-line fisheries (K. Oshima, oshimaka@fra.affrc.go.jp, H. Yamada and Y. Takeuchi)
ISC/07/PBF-1/05	Calculation of length frequency data of Pacific bluefin tuna from Japanese pole-and-line fisheries for use of stock synthesis II application (K. Oshima, oshimaka@fra.affrc.go.jp, H. Yamada and Y. Takeuchi)
ISC/07/PBF-1/06	Estimation of seasonally catch by Japanese set net (M. Kai, kaim@fra.affrc.go.jp)
ISC/07/PBF-1/07	Length frequency of sampled data in the Pacific bluefin tuna caught by Japanese set-net (M. Kai, kaim@fra.affrc.go.jp, and M. Ichinokawa)
ISC/07/PBF-1/8	Recalculation of length frequency data from Japanese purse seine operating north western Pacific and Sea of Japan for use of stock synthesis II application (Y. Takeuchi, yukiot@fra.affrc.go.jp)
ISC/07/PBF-1/09	Estimation of the quarterly catches and size of small PBF by Japanese small pelagic purse seine fisheries in the East China Sea in 1991-2006 (H. Yamada, hyamada@fra.affrc.go.jp)
ISC/07/PBF-1/10	Estimation of quarterly catch of Japanese tuna purse seine operating in the north western Pacific and Sea of Japan catching medium to large bluefin tuna (Y. Takeuchi, yukiot@fra.affrc.go.jp)

ISC/07/PBF-1/11	Length frequency of Pacific bluefin tuna caught by Japanese longliners (M. Ichinokawa,)
ISC/07/PBF-1/12	Preliminary result of searching Japan's catch data of Pacific bluefin tuna in the 1st half of the 20th Century (F. Muto, Y. Takeuchi and K. Yokawa)
ISC/07/PBF-1/13	Biological parameters used for the Pacific bluefin tuna stock assessments in the ISC PBF WG (H. Yamada, hyamada@fra.affrc.go.jp)
ISC/07/PBF-1/14	A research activity for the age determination of bluefin tuna in the western Pacific by NRIFSF (T. Tanabe, katsuwo@fra.affrc.go.jp, T. Itoh, Mi Takahashi, and H. Yamada)
ISC/07/PBF-1/15	Reconsideration to natural mortality of pre-adult and adult Pacific bluefin tuna used in the current stock assessment (Y. Takeuchi, yukiot@fra.affrc.go.jp)
ISC/07/PBF-1/16	Standardized CPUE of north Pacific bluefin tuna caught by Japanese coastal longliners (M. Ichinokawa and Y. Takeuchi)
ISC/07/PBF-1/17	Qualitative analysis on historical change of Japanese longline fisheries for Pacific bluefin tuna (K. Oshima, oshimaka@fra.affrc.go.jp, H. Yamada, Y. Takeuchi and Z. Suzuki)
ISC/07/PBF-1/18	Advances in analytical population modeling of Pacific bluefin tuna from ISC-PBF-2006 (Y. Takeuchi, M. Kai, H. Yamada, K. Oshima and M. Ichinokawa)
ISC/07/PBF-1/19	United States Catch Time Series for Pacific Bluefin Tuna in the North Pacific Ocean (A.L. Coan Jr., al.coan@noaa.gov)
ISC/07/PBF-1/20	An Updated standardization of CPUE of age-0 Pacific bluefin tuna by Japanese troll fishery (H. Yamada, hyamada@fra.affrc.go.jp, K. Oshima and Y. Takeuchi)
ISC/07/PBF-1/21	Estimation of quarterly catch of Pacific bluefin tuna caught by Japanese longline fisheries (K. Oshima, oshimaka@fra.affrc.go.jp, H. Yamada and Y. Takeuchi)
ISC/07/PBF-1/22	Mexican report to the BFTWG (Shimizu, Japan 2007). (Michel Dreyfus, dreyfus@cicese.mx)

ISC/07/PBF-1/23 Brief description on the revision of North Pacific bluefin tuna catches by Taiwanese Fishery (Fishery Agency, Council of Agriculture, Taiwan and Overseas fisheries development council)

ISC/07/PBF-1/24 Catch-at-age estimates for the small-scale longline fishery targeting spawning bluefin tuna (*Thunnus orientalis*) in the southwestern North Pacific Ocean (Hui-Hua Lee and Chien-Chung Hsu)

ISC/07/PBF-1/25 Abundance index for the small-scale longline fishery targeting spawning bluefin tuna (*Thunnus orientalis*) in the southwestern North Pacific Ocean (Hui-Hua Lee and Chien-Chung Hsu)

ISC/07/PBF-1/26 Re-examination of the bluefin tuna CPUE index derived from commercial passenger fishing vessel logbooks 1995-2006 (K. Piner, kevin.piner@noaa.gov, and J. Larese)

ISC/07/PBF-1/27 Size at sexual of female Pacific bluefin tuna in the Sea of Japan (Sho Tanaka)

Appendix 3

INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC (ISC)

BLUEFIN WORKING GROUP
STOCK ASSESSMENT INPUT DATA REVIEW MEETING
And
STOCK ASSESSMENT REVIEW MEETING

April 16(Mon) - April 23 (Mon), 2007

Agenda

1. Registration and distribution of documents,

2. Opening of Workshop,

3. Agenda
   - Adoption of agenda
   - Appointment of rapporteurs

4. Update of fishery statistics
   - Catch
   - Basic effort statistics (number of boats/fishing days etc)

5. Review of historical fisheries data
   - Review of historical catch data in pre-assessment period in both side of the Pacific

- Review of historical catch and size data in assessment period (1952 onward)
  - ✓ Japan
    1. Quarterly catch data
    2. Size data
    3. Separation between Meji and Maguro catch
  - ✓ Chinese-Taipei
    1. longline
    2. Other gear
  - ✓ Korea (in particular, recent catch which was not yet reported to ISC)
  - ✓ EPO (in particular for fish caught for the farms)
    1. review of the fishery
    2. catch destined to farms
  - ✓ Other members' data (NZ, Philippine and other countries if necessary) #No
- Review of Catch at age
- Review of available CPUE series
  - ✓ Japanese longline CPUE in earlier time period
    Including review of Japanese longline operated in Japanese coastal water and catching bluefin
  - ✓ Chinese-Taipei's longline CPUE
  - ✓ Japanese troll CPUE
  - ✓ Habitat index in EPO
  - ✓ Others (Mexican)

6. Review of default biological information

7. Review of biological information
   - Growth curve parameter
   - Maturity ogive
   - Movement

8. Re-examination of stock assessment model input data
   - Review of stock assessment model analyses in the last workshop
     - ✓ ADAPT VPA
     - ✓ Stock Synthesis II
   - Fisheries definition
   - Biological parameters
   - Assessment time period
   - Model structure
     - ✓ Initial population
     - ✓ Weighting of data
     - ✓ Stock-recruitment
     - ✓ Etc.

9. Work assignment for the meeting in July

10. Recommendations and identification of the tasks to be dealt before the next bluefin stock assessment
    - Fisheries data preparation
    - Biological data
    - Stock assessment model

11. Other matters
12. Adoption of report and closure

Table 1. Catch Table for the Stock Assessment

Year	Western Pacific States													Sub Total	Eastern Pacific States					Sub Total	***** Other countries	Grand Total
	Japan							Korean**		Chinese Taipei					United States			Mexico				
	Purse Seine		Longline	Troll***	Pole and Line	Set Net	Others	Purse Seine	Trawl	Longline ****	Purse Seine	Distant Driftnet	Others		Purse Seine	Others	Sport	Purse Seine	Others			
	Tuna PS	Small PS																				
1952	7,680		2,581	439	2,198	2,145	357							15,400	2,076		2			2,078		17,478
1953	5,570		1,998	1,465	3,052	2,335	133							14,553	4,433		48			4,481		19,034
1954	5,366		1,588	1,656	3,044	5,579	266							17,499	9,537		11			9,548		27,047
1955	14,016		2,099	1,507	2,841	3,256	264							23,983	6,173		93			6,266		30,249
1956	20,979		1,242	1,765	4,060	4,170	703							32,919	5,727		388			6,115		39,034
1957	18,147		1,490	2,395	1,795	2,822	208							26,857	9,215		73			9,288		36,145
1958	8,586		1,429	1,509	2,337	1,187	190							15,238	13,934		10			13,944		29,182
1959	9,996		3,667	1,011	586	1,575	154							16,988	6,914		15			6,929		23,917
1960	10,541		5,784	1,846	600	2,032	363							21,166	5,422		1	0		5,423		26,589
1961	9,124		6,175	3,116	662	2,710	598							22,385	8,136		26	130		8,292		30,677
1962	10,657		2,238	978	747	2,545	289							17,454	11,268		28	294		11,590		29,044
1963	9,786		2,104	2,403	1,256	2,797	279							18,626	12,271		8	412		12,691		31,317
1964	8,973		2,379	2,739	1,037	1,475	365							16,968	9,218		8	131		9,357		26,325
1965	11,496		2,062	1,429	831	2,121	356			54				18,348	6,887		1	289		7,177		25,525
1966	10,082		3,388	1,502	613	1,261	114			-				16,960	15,897		23	435		16,355		33,315
1967	6,462		2,099	3,115	1,210	2,603	282			53				15,824	5,889		36	371		6,296		22,120
1968	9,268		2,278	1,407	983	3,058	203			33				17,231	5,976		1	195		6,172		23,403
1969	3,236		1,366	1,836	721	2,187	184			23				9,553	6,926		17	260		7,203		16,756
1970	2,907		1,123	1,181	723	1,779	215			-				7,929	3,966		21	92		4,079		12,008
1971	3,721		757	2,189	938	1,555	226			1				9,386	8,360		8	555		8,923		18,309
1972	4,212		724	2,385	944	1,107	154			14				9,539	13,348		17	1,646		15,011		24,550
1973	2,266		1,158	3,519	526	2,351	576			33				10,430	10,746		61	1,084		11,891		22,321
1974	4,106		1,220	2,994	1,192	6,019	679			47				16,258	5,617		65	344		6,026		22,284
1975	4,491		1,558	941	1,401	2,433	781			61				11,667	9,583		38	2,145		11,766		23,433
1976	2,148		520	920	1,082	2,996	1,226			17				8,910	10,646		23	1,968		12,637		21,547
1977	5,110		712	2,230	2,256	2,257	1,031			131				13,727	5,473		21	2,186		7,680		21,407
1978	10,427		1,049	4,757	1,154	2,546	2,183			66				22,183	5,396		5	545		5,946		28,129
1979	13,881		1,223	2,659	1,250	4,558	2,200			58				25,830	6,118		12	213		6,343		32,173
1980	11,327		1,170	1,494	1,392	2,521	1,931			114				19,948	2,938		8	582		3,528		23,476
1981	25,422	8	796	1,758	754	2,129	2,540			179				33,587	867	15	6	218		1,106		34,693
1982	19,234		880	872	1,777	1,667	1,622	31		207	-	11		26,302	2,639	4	7	506		3,156		29,458
1983	14,774	10	707	2,020	356	972	892	13		175	9	12		19,939	629	134	21	214		998		20,937
1984	4,433		360	1,905	587	2,234	658	4		477	5			10,664	673	34	31	166		904		11,568
1985	4,154	8	496	1,920	1,817	2,562	992	1		210	80	67		12,308	3,320	155	55	676		4,206		16,514
1986	7,412		249	1,562	1,086	2,914	468	344		70	16	81		14,202	4,851	339	7	189		5,386		19,588
1987	8,653	19	346	1,030	1,565	2,198	308	89		365	21	87		14,681	861	114	21	119		1,115		15,796
1988	3,583	18	241	1,190	907	843	403	32		108	197	234	197	7,953	923	81	4	447	1	1,456		9,409
1989	6,077	89	440	1,025	754	748	204	71		205	259	319	259	10,450	1,046	65	70	57	0	1,238		11,688
1990	2,834	125	396	1,291	536	716	351	132		189	149	305	149	7,174	1,380	165	40	50	0	1,635		8,809
1991	4,336	4,421	285	2,168	286	1,485	340	265		342	-	107	-	14,035	410	11	57	9	0	487		14,522
1992	4,255	2,387	573	908	166	1,208	986	288		464	73	3	73	11,385	1,928	128	93	0	0	2,149		13,534
1993	5,156	1,102	857	534	129	848	263	40		471	1		4	9,404	580	103	114	0	0	797		10,201
1994	7,345	564	1,138	3,427	162	1,158	301	50		559			-	14,705	906	160	24	63	2	1,155		15,860
1995	5,334	12,009	769	4,618	270	1,859	225	821		335			2	26,242	689	49	166	10	0	914		27,156
1996	5,540	1,798	978	3,203	94	1,149	276	102		956			-	14,097	4,523	70	30	3,700	0	8,323		22,420
1997	6,137	5,862	1,383	2,634	34	803	379	1,054		1,814			-	20,101	2,240	85	90	367	0	2,782		22,883
1998	2,715	2,269	1,260	2,550	85	874	238	188		1,910			-	12,089	1,771	271	213	1	0	2,256		14,345
1999	11,619	3,863	1,155	3,164	35	1,097	150	256		3,089			-	24,428	184	85	397	2,369	35	3,070		27,498
2000	8,193	6,802	1,005	4,367	102	1,125	271	794	0	2,780			2	25,440	693	61	220	3,025	103	4,102		29,542
2001	3,139	3,912	1,004	3,124	180	1,366	457	995	10	1,839			104	16,130	149	47	226	863	0	1,285		17,415
2002	4,171	4,359	889	2,422	99	1,011	590	674	1	1,523			4	15,743	50	12	348	1,708	6	2,124		17,867
2003	945	4,850	1,230	1,695	44	841	710	1,591	0	1,863			21	13,790	22	17	229	3,211	46	3,525	28	17,342
2004	4,792	2,218	1,311	2,067	132	896	1,091	636	0	1,714				14,857	0	11	34	8,880	11	8,936	27	23,820
2005	3,927	6,249	1,824	3,382	549	4,595	725	1,476		1,368				24,094	201	5	79	4,488		4,773	14	28,881
2006*	3,780	3,317	1,037	1,445	108	2,907	697	1,007		1,148				15,447	0	1	96	9,706		9,803	57	25,306

* Preliminary for 2006
** Catch statistics of Korea derived from Japanese Import statistics for 1982-1999, and 2005-2006 as minimum estimates.
*** The troll catch for farming estimating 10 - 20 mt since 2000, is excluded.
**** Catches of Chainese Taipei's longline for 2005 and 2006 are preliminary.
***** Other countries include NZ, AUS, Cooks, and so on. Catches derived from Japanese Imort Statistics as minimum estimates.