

Preparation of Japanese catch/effort data and CPUE series for  
2004 stock assessment and mechanical update of Operating Model.

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**Summary:** Data preparation process of Japanese fleet data for 2004 stock assessment and mechanical update of Operating Model is briefly described with a special emphasis on difference from 2001 data preparation. Data used for calculation of CPUE series is also described.

**要約:**2004年の資源評価と Operating Model の機械的な update に使用するデータのうち、日本船の操業データの準備作業について説明する。CPUE 計算に用いたデータについても記述した。

## 1. Introduction:

This document describes the preparation process of catch, effort, and size data of Japanese longline fishery to be used for 2004 CPUE series calculation, stock assessment and mechanical update of Operating Model following to the agreement at the small group discussion held in a periphery of 3<sup>rd</sup> Meeting of Management Procedure Workshop, April 2004 (Attachment 7 of Anon. 2004).

## 2. Review of available data set:

### 2.1. Logbook catch and effort data

Historically, a collection of catch and effort data of Japanese longline fishery has almost exclusively relied on logbook reports. Logbook reporting is an obligation for all fishing vessels operating under the Japanese flag with offshore fishery licenses. Logbook reporting should be made at the time of port call. Due to a general extension of one cruise of distant water fleet, logbook sheet is only available about one year after operation as the earliest.

The format of logbook has been revised occasionally. The current logbook carries noon position in degrees, operating codes, and number of hooks used, number of hooks between floats, and numbers and weights of fish caught by species if vessel is in operation, in addition to reporter's identification information. Five tunas (bluefin, southern bluefin, albacore, bigeye, and yellowfin), skipjack, swordfish, five billfishes (striped marlin, blue marlin, black marlin, sailfish and shortbill spearfish) and five shark species are required to identify as catch species categories. Catch weight was not reported with the logbook till 1993.

Those logbook data are transferred to the National Research Institute of Far Seas Fisheries (NRIFSF) for data examination and compilation. Mechanical filtering is used to identify extraordinary and/or erroneous data. Original logbook data are aggregated by month and by 5x5 degrees squares and raised using a total number of operations by areas by ten days reported from industries including the Federation of Japan Tuna Fisheries Co-operative Association. The areas used in this practice are

different from the statistical areas in the CCSBT framework. The reported catch weight is a processed weight, e.g. gutted weight for bigeye, yellowfin and southern bluefin tuna, and is converted to whole live weight using a fixed conversion factor of each species.

Data entry, checking, aggregation, and raising are conducted for a whole Japanese distant water longline fleet. This database is continuously revised and updated, and used as a basis for reporting of Japanese catch and effort information to any of the Regional Fisheries Management Organizations (RFMOs) including the CCSBT. Although the majority of data is arrived within about three years after operations, minor revisions are commonly occurred in much longer period.

All original logbook data are now electrically entered, covering 1959 and onward. However, the coverage and aggregation in the earlier years' data are not as good as those of recent years.

## 2.2. RTMP (Real Time Monitoring Program) data:

The RTMP was originally established in 1991 with two objectives: 1) to collect stock abundance information (CPUE) from time/area where commercial operations were suspended due to time/area closure corresponding to a substantial quota reduction in 1989, and 2) to obtain tentative CPUE information as promptly as possible to compensate about two-years' delay of commercial longline catch and effort data. At the first phase of the Program, small number of vessels selected operated under a special RTMP quota allocation free from domestic regulation toward commercial fleet. Those vessels reported noon position, operating mode, number of hooks and baskets used, number and weight of catch by species, and body length, weight and sex of all individual southern bluefin tuna (SBT) caught, every day through FAX.

When the special RTMP catch allocation became not available in 1995, Japan decided to apply the same reporting format to the whole fleet targeting on SBT. This change meant a shift of objectives toward real-timeliness of data collection, i.e. '2)' above.

The NRIFSF maintains all data collected by the RTMP as an independent database from the logbook catch and effort data. In addition, size measurements collected through the RTMP are converged to the size measurement database. Due to a high coverage of SBT catch, the RTMP is dominant source of SBT size data.

## 2.3. Size measurement data:

Size data of Japanese tuna longline catch are a combination of various sources including voluntary on-board measurements, market measurements by field technicians, reports from training and research vessels, observer programs and RTMP data.

Data availability, composition of length and weight measurements, and general problems of size data were reviewed and reported several times (Tsuji et al. 2000a, 2000b). Data is available since 1965. Proportion of length measurement also varies among year. In general, weight measurements are dominated during the 1980's. Coverage for SBT catch was substantially improved in 1992 and reached to almost 100% by establishment of the RTMP.

## **3. Data provided to the CCSBT:**

### 3.1. Data provided in the past:

Prior to the establishment of the CCSBT database, Australia, Japan and New Zealand have exchanged catch, effort and size data needed for assessment since 1983 every year. At least since 1989, only data for the last year and revised data for one year before the last have been provided. The way of data provision before that time could not be traced.

Data provided up to 1994 should be based on the NRIFSF logbook based statistics described in 2.1 following the common practice of data provision to the RFMOs. Comparison of data used in historical assessment and data processed from the most recent version of NRIFSF logbook based statistics showed exact match up to 1989 and diverted afterward. We consider this diversion caused by constraining to only one revision for data exchanged for SBT assessment whereas the NRIFSF logbook based statistics revised up to five years or more after the first data entry.

Data of 1995 onwards is a combination of RTMP and logbook based data, processed independently from the NRIFSF logbook based statistics. RTMP data is characterized with its promptness and high coverage on SBT targeted operations. On the other hand, logbook reporting is considered as an official source of Japanese catch and effort data. Then, two data sets are combined and removed RTMP data for operations that both data sets cover. Here, original logbook data is used. Data operated under Joint Venture arrangements were also removed. Again, only one revision has been made and additional year's data and revised data from the last have been exchanged every year.

In 1995 and 1996, Japanese industry decided to release fish smaller than 25kg. Number of those non-retained catch was estimated based on reports and the mortality of 23.53% was agreed to apply. This figure was based on observers' data on proportion of sluggish fish among still alive at the time of retrieval.

Catch and effort taken by Experimental Fishing Program (EFP) during 1999 and 2000 were also included in catch and effort data under separate category. Released catch with tags during the EFP was not included in catch and effort data. None of catches taken with research surveys such as the Recruitment Monitoring Program were included.

Catch at size data was originally processed and provided by Japan. Automated substitution and age assignment developed by Australia was introduced in 1994 (ref). Since the program only executable by the CSIRO, substitution and age assignment were done by Australia until 2001.

Size data is only available since 1965 but the file of size composition of SBT catch by quarter and CCSBT Statistical Area for 1952 to 1964 exists. No records remained on the procedures and sources used to compile this information.

Data provided for the 2001 assessment followed the procedures mentioned above.

### 3.3. Data provided to the CCSBT database as a historical data:

The CCSBT agreed to establish a common database in 2001. Agreed format of data provision include information not processed through a regular data compilation such as number of vessels in operation by strata. Then, we tried to re-generate historical SBT catch and effort statistics from original logbook data, which was provided to the CCSBT database as a historical data. During the process, we found some inconsistency in raising factors between catch of different species and

efforts, which make it impossible to regenerate the NRIFSF historical statistics perfectly. The NRIFSF logbook based statistics is a result of accumulation of continuous data examination and correction based on the best experiences at that time. Unfortunately, all details of historical works cannot be traced anymore.

#### 3.4. Data provided for the 2001 Operating Model:

Details on the data preparation for the 2001 OM are available in Tsuji (2002). Description here puts an emphasis on errors detected afterwards and differences from the other data set.

Catch and effort data for the 2001 Operating Model (OM) was processed from the NRIFSF logbook based statistics available at that time, i.e. May 2001. Errors in area assignment were found after data provision. This causes errors up to 0.5% for catch in LL1 and more substantial impacts on LL3 and LL4 catches by Japan because of small catch. No errors were introduced for data before 1965.

Data for the 2001 OM differed substantially from the data used in 2001 assessment for catch and effort data of 1989 onward. The difference caused by different reason before and after 1995: Different in version of the NRIFSF logbook based statistics used for 1989 to 1994 data, i.e. version of May 2001 for OM data and version available two years after operation for assessment data, and difference in data sources for 1995 onwards, i.e. the NRIFSF logbook based statistics for OM data and combination of RTMP and original logbook data for assessment. Non-retention catch in 1995 and 1996 were erroneously not included in LL1 catch.

Size data was also re-processed. The procedure followed agreement in 1994 but differed in the following points:

- One set of equations (the one agreed for fish larger than 130cm) was used to convert between weight and length because of distinct discontinuity of two curves at the connecting point of 130cm. This change was only applied to LL1 and the 1994 agreed procedure was used for fish in reproductive area, i.e. LL3 and LL4.
- Substitution criteria was change to 1) less than 30% of catch measured AND 2) less than 50 fish measured. (1994 agreement is to be substituted if 1) less than 200 fish measured OR 2) less than 4% measured)

#### **4. Decision on data for 2004 SAG/SC:**

At the small group discussion held in conjunction with the 3<sup>rd</sup> Management Procedure Workshop, it was agreed that 2004 stock assessment and OM mechanical updates would use the same sets of data used in 2001 with only revision and update of data required since 2001. During data preparation, several problems were recognized including follows:

- Error in area assignment in the 2001 OM data,
- Difference in data sources and procedures between 2001 OM data and the data used for assessment of 2001, and
- Difference in procedures, substitution criteria and L-W conversion equations used for

preparation of size data between 2001 OM data and the data used for assessment of 2001.

Through intensive e-mail discussion among relevant people, the sources of data used for 2004 SAG/SC activities as follows. The Secretariat reported the final decision to all relevant members through e-mail and whole process in Anon. (2004a).

Sources of Japanese data used for 2004 SAG/SC activities:

- 1952-1964: Catch in number and weight by size/quarter/area historically used.
- 1965-1994: Catch and effort extracted from the NRIFSF logbook based statistics of 2001 May version. It was confirmed no updating made for data in this period. The same size processed for 2001 OM, except correcting errors in Area assignment.
- 1995-2003: Data in the CCSBT database except addition of 2003 data and update of 2002 data. All retained catch of both investigation and commercial included. Non-retained commercial catch of 1995 and 1996 were erroneously not included. None of tagged and released fish were included.
- Size frequencies for LL1 include both research and commercial data. Research data were excluded from size frequencies for Area 8 and 9 to be used for substitution of Korea and Taiwan LL1 catch. Size frequencies of research data combined both retained and non-retained fish but adjusted to the total number of retained catch.

## **5. CPUE series for 2004 assessment and mechanical update of Operating Model:**

### 5.1. Age-based w0.5 (B-ratio proxy) and w0.8 (Geostat proxy) CPUE indices

Catch numbers and corresponding effort data for age classes 4 to 12+ by year (1969-2003), month (April-September) and 5x5 degree square were used for CPUE standardization by GLM. The data set was prepared by combining data for Japanese longline fisheries (1969-2003) and for Japanese joint venture longline fisheries with Australia (1989-1995) and New Zealand (1992-2003).

Source data files exchanged prior to w0.5 and w0.8 series calculation were summarized in Table 5-1. For the period 1969-1994, catch and effort (CE) data, and size data of Japanese longline fisheries were fully replaced for the 2004 assessment, and thus were different from the ones used for the last assessment in 2001. The reason for this replacement was documented in the Section 4 and Anon (2004b). CE data and size data for 1995-2001 were revised and also different from data used for the last assessment in 2001.

Data for Japanese longline fisheries for 2002-2003 and for Japanese joint venture longline fisheries with Australia (1989-1995) and New Zealand (1992-2003) were provided in the form of catch at age by 5x5/month. To obtain Japanese longline catch at age by 5x5/month for 1969-2001, size data for this period (L5\_6594.mdb and 1995-2001 size data in CCSBTData.mdb) were converted to age by using proportional ageing. Proportional ageing here means that when certain length bin includes cut point(s) of age classes which were determined from a growth curve, its associated catch is divided into two (or more) age classes linearly proportionally to where the cut point(s) divides the bin. We used monthly cut points which were determined corresponding to 1<sup>st</sup> day of January-December for 1969-2003 from the agreed growth curve (Anonymous 2001). This Japanese longline catch at age

for 1969-2001 was then combined with catch at age for Japanese longline for 2002-2003 (02SBTCatchAge.mdb and 03SBTCatchAge.mdb), Japanese joint venture longline with Australia for 1989-1995 (AUS\_JV\_CE\_Age\_5x5xm\_AllQuarters\_AllAreas.xls) and New Zealand for 1989-2003 (NZ\_JV\_CE\_Age\_1989-2003\_5x5xm\_AllQuarters\_AllAreas.xls). This data set contains the following information: catch numbers for age classes 1-19 and 20+, and corresponding effort by year (1969-2003), quarter (2 and 3), month (April-September), SBT statistical area (4-9), and 5x5 degree square's latitude and longitude (this data set was distributed as caa\_for\_cpue(5x5M)Jp.xls via Bob Kennedy, CCSBT on July 12, 2004).

Table 5-1 Source data for w0.5 and w0.8 CPUE index calculation

Fisheries	Period	File name	Content	Provider	Date
Jpn LL	1969-1994	L5_6594.mdb *1	Size data(5M)	S.Tsuji (NRIFSF)	Jun.25,2004
	1995-2001	CCSBTData.mdb	CE and size data(5M)	B.Kennedy (CCSBT)	Previously provided by CD
	2002-2003	02SBTCatchAge.mdb 03SBTCatchAge.mdb	Catch at age(5M)	T.Itoh (NRIFSF)	May25,2004 (02 data) Apr.30,2004 (03 data)
Aus-Jpn JV	1989-1995	AUS_JV_CE_Age_5x5xm_AllQuarters_AllAreas.xls	Catch at age(5M)	J.Hartog (CSIRO)	Jul.6,2004
NZ-Jpn JV	1989-2003	NZ_JV_CE_Age_1989-2003_5x5xm_AllQuarters_AllAreas.xls	Catch at age(5M)	J.Hartog (CSIRO)	Jul.2,2004

\*1 The same data as in L5\_6594.mdb was later provided in the CCSBT database format after June 25, 2004.

Methods of CPUE standardization by GLM, calculation of area index for SBT distribution, and w0.5 and w0.8 series calculation from the standardized CPUE and the area index were all same as the ones used for the last assessment in 2001 (Takahashi et al. 2001). Data for released SBT that were less than 25 kg (primarily age 4 or younger) from the high seas RTMP longline vessels in 1995-96 (Itoh et al. 1998) were not included in the data set. Thus, data for age 4 for 1995-96 were not used in the GLM standardization as in the previous analysis (Takahashi et al. 2001). Calculation of the area index was based on 1x1 fished square information of Japanese longline fisheries (extracted from NRIFSF database) and Japanese longline joint venture with New Zealand (extracted from NZ\_JPCharterFleetCE\_OneDegree\_1989-2003.mdb, provided by Bob Kennedy, CCSBT on June 24, 2004 with permission from Talbot Murray, Ministry of Fisheries, NZ). The area of Japanese longline joint venture with Australia (1989-1995) was not included in the definition of SBT distribution because 1x1 area information for this fishery was not available.

CPUE indices of w0.5 and w0.8 were calculated for age classes, 3, 4, 5, 6 & 7, 8-11, 4+, 8+, and 12+. Trends of these indices are shown in Tsuji et al. (2004). The CPUE index for age class 4+ was used in updating the operating model (OM) (Anonymous 2004c). The indices for other age classes were used in ADAPT VPA analyses, except for age 3 (Hiramatsu and Tsuji 2004).

## 5.2. Length-based w0.5 (B-ratio proxy) and w0.8 (Geostat proxy) CPUE indices

Source data files for length-based w0.5 and w0.8 indices were all same as used in the age-based

indices above (Table 5-1), except for size data for 2002-2003 (03SBTSizeData.mdb submitted on April 30, 2004, 02SBTSizeData.mdb submitted on May 27, 2004, both by T. Itoh, NRIFSF). These size data (catch at each 1 cm or 2 cm bin) were categorized into length classes, 60-80, 90-100, 110-130, 140-150, 160, 170, 180, and 190+. Combining the catch at length with effort data, the resultant data set contains information of catch numbers for length classes and corresponding effort by year (1969-2003), quarter (2 and 3), month (April-September), SBT statistical area (4-9), and 5x5 degree square's latitude and longitude. Data for Japanese joint venture longline fisheries with Australia and New Zealand were not combined in the data set because size data for these fisheries were not available.

Methods of CPUE standardization by GLM, and calculation of length-based w0.5 and w0.8 series from the standardized CPUE and the area index were all same as used for age-based series above. The same area index of SBT distribution as prepared for the age-based series was used. Data for 130cm or smaller sized fish for 1995-96 were not used in the GLM standardization by the same reason as the age-based series (see above).

Length-based CPUE indices of w0.5 and w0.8 were calculated for size classes, 60-80, 90-100, 110-130, 140-150, 160, 170, 180, and 190+. These indices were used in length-based VPA analyses and shown in Kurota and Takahashi (2004).

### 5.3. "Spatial-Temporal (ST) window" CPUE index

Catch and effort data by 1x1/month were extracted from NRIFSF database to calculate "ST window" CPUE index. The same calculation method as described in Takahashi et al. (2002) was used. The agreed growth curve (Anonymous 2001) was applied to create 1x1 catch at age data for age class 4+. "ST window" series was computed for age class 4+ only. Trend of this index is shown in Tsuji et al. (2004). This CPUE series was used in updating the operating model (OM) (Anonymous 2004c).

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